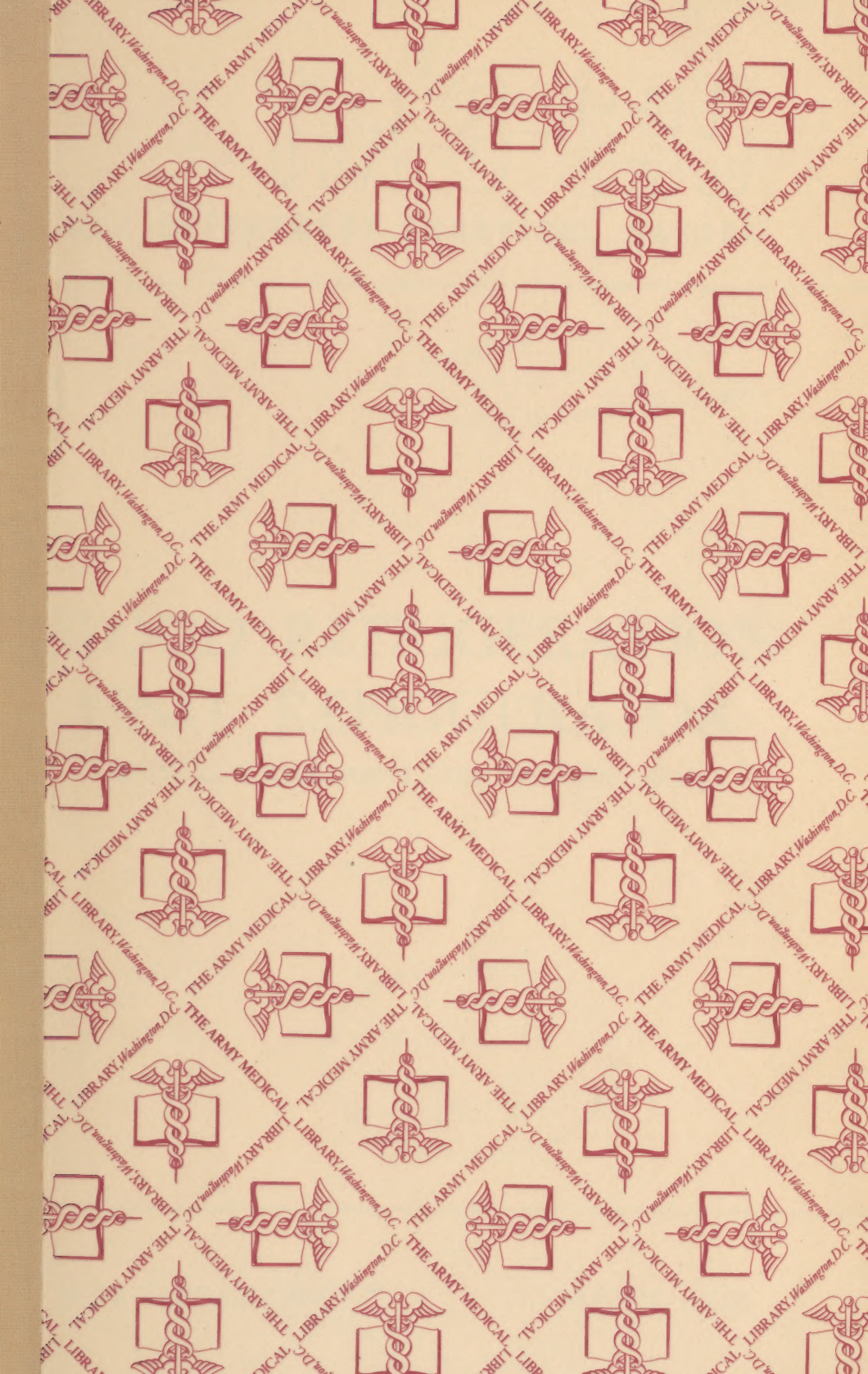
U. S. WAR DEPT. TECHNICAL MANUAL 8-635

BLOOD REFIGERATIONS UNIT REFIGERATOR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TM 8-635

WAR DEPARTMENT TECHNICAL MANUAL

BLOOD REFRIGERATION UNIT REFRIGERATOR

(MEDICAL DEPARTMENT ITEM NUMBER 9960110)

WAR DEPARTMENT *APRIL 1945*

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TM 8-635

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(MEDICAL DEPARTMENT ITEM NUMBER 9960110)

WAR DEPARTMENT *1 APRIL 1945*

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Washington 25, D. C., 1 April 1945

TM 8-635 Blood Refrigeration Unit Refrigerator (Medical Department Item No. 9960110), is published for the information and guidance of all concerned.

[AG 300.7 (18 Apr 45)]

By order of the Secretary of War:

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J. A. ULIO
Major General
The Adjutant General

G. C. MARSHALL
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For explanation of symbols, see FM 21-6.

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PART ONE
INTRODUCTION
Section I
General

1. SCOPE

a. Contents of Manual. These instructions are published for the information and guidance of the personnel to whom this equipment is assigned. They contain information on the operation and maintenance of the equipment as well as descriptions of the major units and their functions in relation to the other components of the equipment. They apply only to the Unit, Blood Refrigeration, Refrigerator: Medical Department Item No. 9960110. These instructions are arranged in five parts: Part One, Introduction; Part Two, Operating Instructions; Part

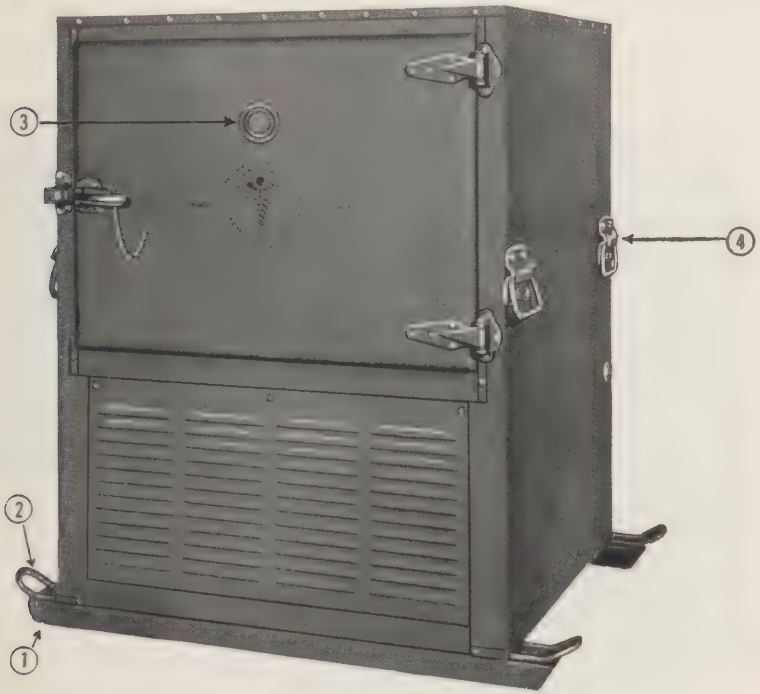


Figure 1. Unit, blood, refrigeration, refrigerator.

Med. Dept. No.	Nomenclature
1.	*Cabinet skids*
2.	*Tow and lifting rings*
3. 9R27038	*Thermometer, dial*
4. 9R27010	*Handles, lift, cabinet*

Three, Maintenance Instructions; Part Four, Auxiliary Equipment (does not apply) and Part Five, Repair Instructions.

b. List of Publications. Publications applicable to the material covered by this manual are listed in the Appendix. Those parts of illustrations keyed with Medical Department numbers and formal nomenclature are regularly supplied as spare parts. All requisitions for spare parts should be submitted in accordance with latest A.S.F. Supply Catalog Med-7.

c. Importance of Manual. Refrigeration servicing and repair work differ from most other mechanical servicing in that the system must be kept free of air, dirt and moisture. Considerable damage may result if operation, adjustment or repair of the refrigeration system is attempted without thorough study of specific directions for servicing.

2. RECORDS

No records are required to be kept on this item except as may be designated by the Medical Officer in charge.

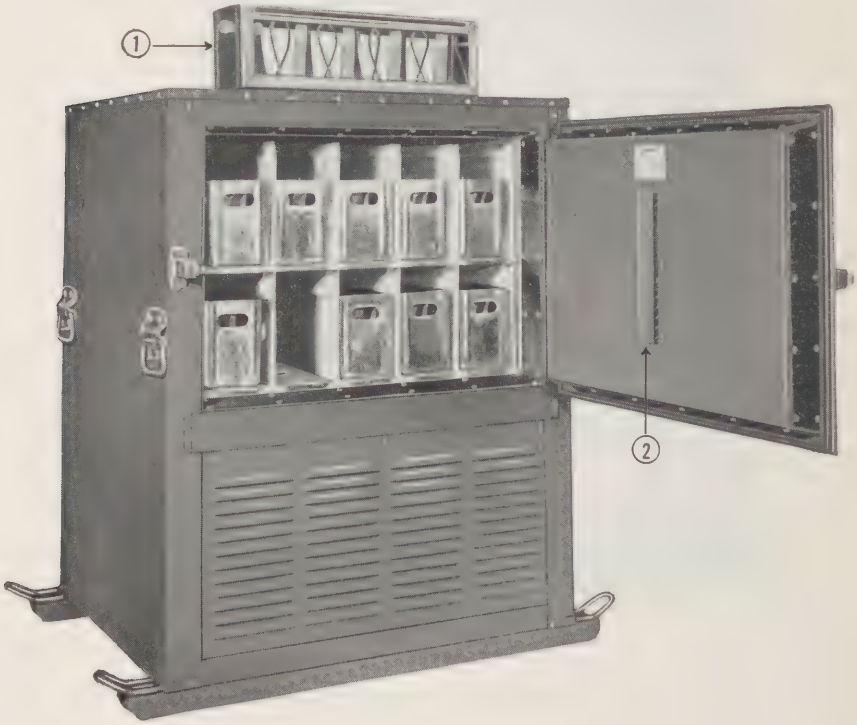


Figure 2. Storage compartment.

Med. Dept. No.	Nomenclature
1. 9R27050	*Racks, bottle*
2.	*Thermometer bulb.*

Section II
Refrigeration and Control Cycle

3. THEORY OF REFRIGERATION

a. The boiling or evaporation is a cooling process. When enough heat is applied to any liquid, the liquid absorbs the heat and becomes a gas. When ordinary water is placed over a flame the water absorbs heat and evaporates, thus becoming steam. All the water will finally boil away or evaporate if left on the flame for a period of time. If pure water is boiled at sea level, it will boil at a temperature of 212 degrees Fahrenheit.

b. In refrigeration machines, the evaporation or boiling of a liquid is the cooling process. In substitution for water, liquids that boil at much lower temperatures than 212 degrees Fahrenheit are used.

c. Gas, F-12, 25 gallon drum, 9R20008, or Freon 12, as it is called, is the refrigerant used in this piece of equipment and will boil at minus 21.7 degrees Fahrenheit. If liquid Freon 12 were placed in an open container the liquid would boil producing a temperature of minus 21.7 degrees Fahrenheit. If this container of Freon 12 were placed in a temperature below 21.7 degrees Fahrenheit, the refrigerant would not boil for the heat in the air would not be sufficient.

d. The heat leaking through the cabinet walls or the heat emitted from the stored products is sufficient to cause the refrigerant to boil. Refrigerant in this piece of equipment is contained in a set of cold plates called the "evaporator" and make up the walls of the container racks.

e. Since it is not practical for refrigerants to be permitted to boil away or pass into the atmosphere, it is necessary to reclaim them and use them over. Obviously, the refrigerant in the gas form, laden with heat, must be condensed or changed back into a liquid to facilitate its re-use. This is done by pumping the gas to a set of coils known as the "condenser", in which the gas is cooled and liquified and then is stored in a tank called the "liquid receiver" where it is held until needed in the evaporator.

4. EXPLANATION OF REFRIGERATION CYCLE

a. The cycle of refrigeration in this compression system is clearly shown in fig 3, and a description of the fundamentals is embodied in the following paragraphs:

b. Begin with the evaporator unit marked "A". Heat will not flow from one body of matter to a body of higher temperature. Wherever a difference in temperature exists the flow of heat will be from the warmer body to the cooler body.

c. As the pressure on the surface of any liquid is reduced, the liquid will boil at a lower temperature and conversely, as the pressure increases the boiling temperature increases. By regulating the pressure in the

evaporator the boiling of Freon 12 refrigerant can be controlled. Since temperature is directly dependent upon pressure, we can control the temperature in the refrigerator by the pressure maintained in the evaporator. The evaporator is therefore kept at a lower temperature by the boiling refrigerant in the unit, and there is a continual flow of heat to it from the air in the cabinet.

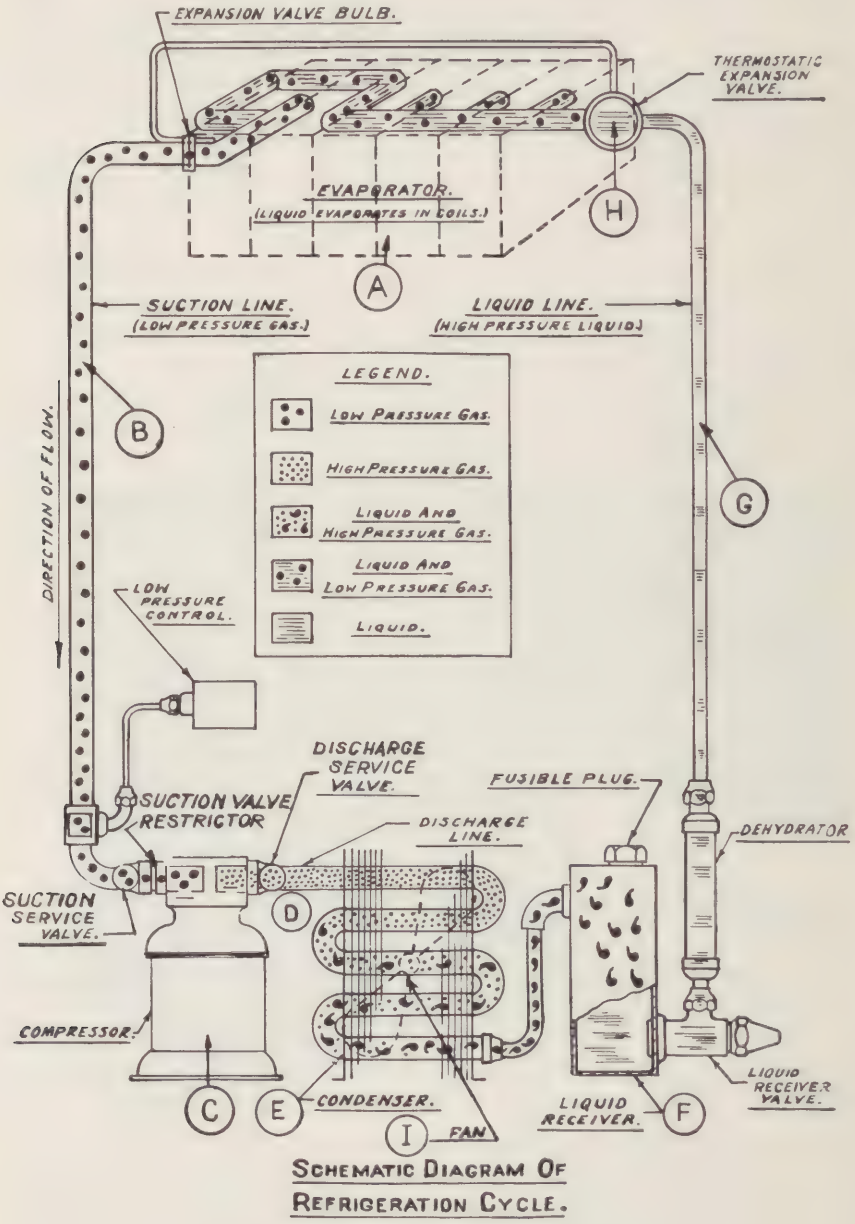


Figure 3. Refrigeration cycle.

d. As the refrigerant changes from a liquid to a gas, the compressor "C" draws the gas through the suction line "B", and compresses it through the discharge line "D". It then passes into the condenser "E" and is condensed back to a liquid due to the increase of pressure from the compressor and the removal of the heat from the gas by the action of the fan "I" passing over the condenser. To condense gas simply by removal of heat is not practical, nor is it practical to condense the gas by increasing pressure. For these reasons the refrigerant is condensed by both methods combined. The pressure is increased by the compressor and the heat is removed from the gas to the atmosphere by passing air over the condenser with a fan.

e. The liquid refrigerant then flows into the liquid receiver "F" where it is stored under pressure until more liquid is needed in the evaporator "A". When the need for refrigerant in the evaporator arises, the expansion valve "H" allows the liquid to flow from the liquid line "G" into the evaporator "A" under low pressure, where it again boils and begins another cycle through the system.

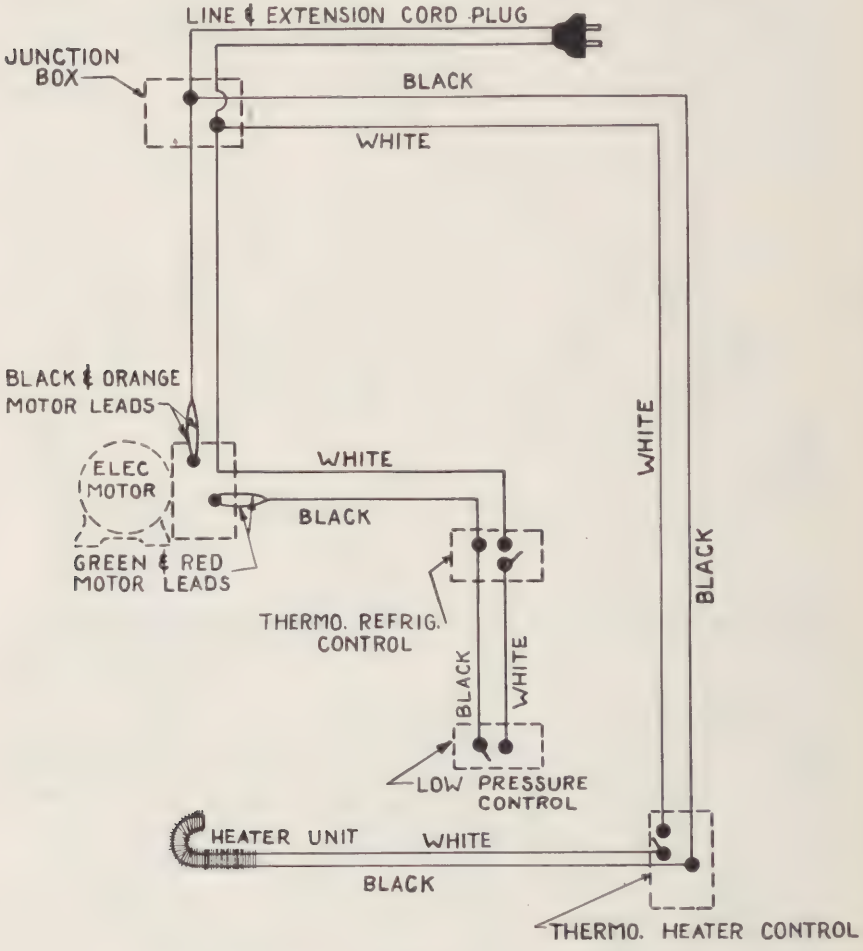
Figure 4. Refrigerant flow chart.

5. EXPLANATION OF HIGH AND LOW SIDE OF THE SYSTEM

a. There are two pressures in the system—a low and a high pressure (fig 4). All the equipment from the discharge side of the compressor up to the expansion valve is the high pressure side; and from the expansion valve to the discharge side of the compressor is the low pressure side.

6. ELECTRICAL WIRING

a. The refrigeration thermostatic control, 9R27190, the low pressure control, 9R27202, and the condensing unit motor, 9R27152 (fig 6), are wired in series. The heater thermostatic control, 9R27056 (fig 6), is wired in the line ahead of the other two controls (see Wiring Diagram fig 5).



WIRING DIAGRAM FOR
UNIT, BLOOD REFRIGERATION, REFRIGERATOR

Figure 5. Wiring diagram.

b. Control adjustments are set to permit refrigeration to be controlled by the refrigeration thermostatic control and heat by the heater thermostatic control without conflict. The low pressure control is adjusted to serve only as an emergency cut-out to prevent a freeze-up in the storage compartment should the refrigeration thermostatic control fail to stop the unit. The low pressure control will also stop the unit in the event of a refrigerant loss.

c. The condensing unit motor is equipped with an automatic overload protector switch (fig 65, item 5). The purpose of this overload protector switch is to open the circuit to the condensing unit motor should an overload be imposed upon the motor.

Section III
Description and Data

7. GENERAL DESCRIPTION OF REFRIGERATOR

a. Purpose. This refrigerator is designed specifically for the storage of whole blood and is maintained at an average temperature of 43 degrees Fahrenheit in the cooled compartment. The storage compartment contains 10 bottle racks (fig 2, item 1) with a capacity of 5 bottles each, or a total capacity of 50,500 cc or 1000 cc bottles of whole blood. The cooling temperature is maintained by a condensing unit of 1/4 horsepower located in the bottom of the cabinet (fig 9, item 13). In addition to the refrigeration system, a heating unit is located in the storage space (fig 8, item 5) to provide heat should the surrounding temperature be low enough to produce an inside temperature lower than that desired. Handles (fig 1, item 4) are provided on each side of the cabinet to facilitate moving. The cabinet is also equipped with tow and lifting rings (fig 1, item 2) extending from the skids (fig 1, item 1). General physical characteristics are shown in fig 1.

b. Manufacturer. This item is manufactured for the Medical Department by Mills Industries, Incorporated, 4100 Fullerton Avenue, Chicago 39, Illinois.

8. DESCRIPTION OF THE MAIN PARTS OF THE REFRIGERATOR

a. Evaporator. The interior of the storage compartment is equipped with an evaporator (fig 8, item 2) which serves also as the partitions and supporting brackets for shelves for the bottle racks. The construction and design is such that the refrigerated plates of the assembly permit rapid transfer of heat from the racks through the supporting shelves and into the refrigerant contained within the walls of each section.

b. Racks. The sliding, removable bottle racks (fig 2, item 1) are designed to hold 2 types of 500 cc bottles, and 1 type of 1000 cc bottles. Springs are arranged to hold bottles securely during transportation.

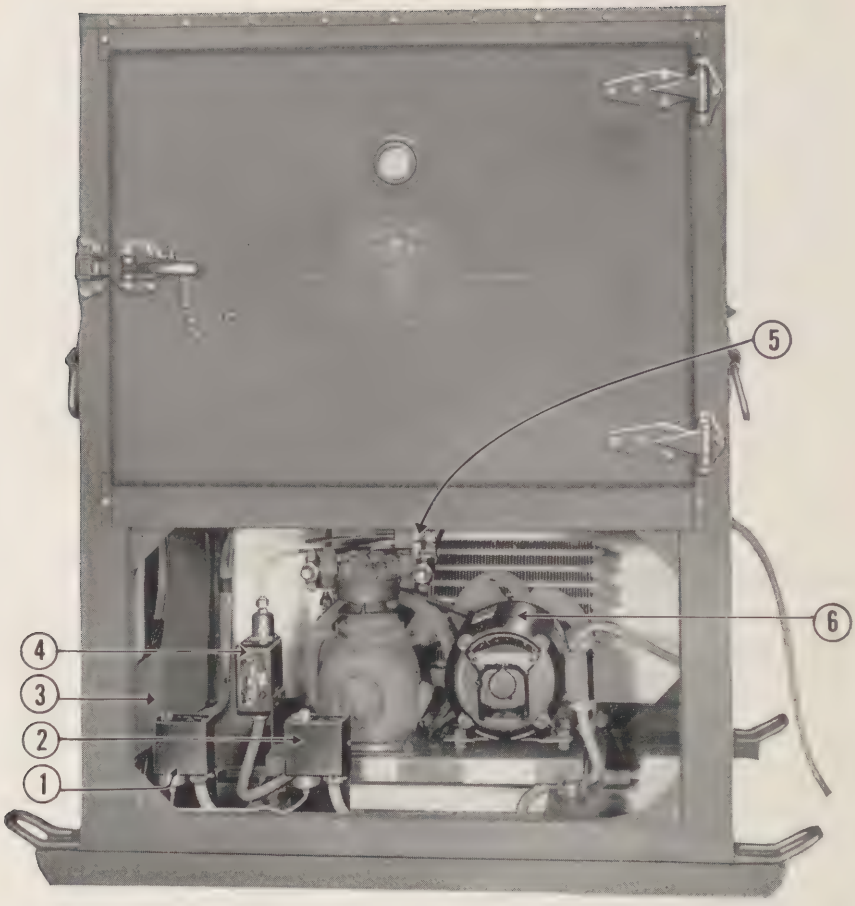


Figure 6. Condensing unit, front view.

	Med. Dept. No.	Nomenclature
1.	9R27056	*Control, thermostatic, heater*
2.	9R27190	*Control, thermostatic, refrigeration*
3.		*Manual compartment*
4.	9R27202	*Control, pressure, low*
5.	9R27200	*Valve, drain, shutoff*
6.	9R27152	*Motor, electric, complete*

c. *Shelves.* Removable shelves (fig 8, item 1) are provided between the plates to serve as slides for the bottle racks. By removing these shelves it is possible to clean the compartment. A drain in the bottom of the compartment has been provided for the removal of excess cleaning substance. A drain valve (fig 6, item 5) is provided on the outlet end of the drain to prevent warm air from entering the cabinet. This valve must be kept closed during normal operation.

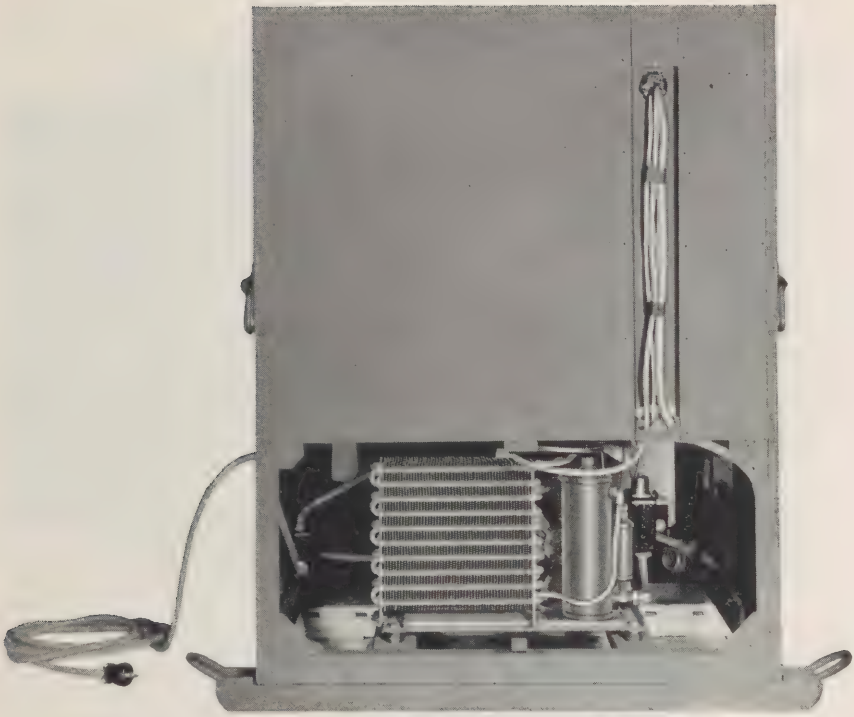


Figure 7. Condensing unit, rear view, with tube channel cover removed.

d. Heater Unit. A heater unit (fig 8, item 5) has been incorporated in the refrigerator so that in case this equipment should be operated in temperatures lower than the desired temperature for the storage of blood, the refrigeration mechanism automatically shuts off and the heater unit automatically operates. This heater unit is independent of the refrigeration equipment and is connected through the junction box direct to the main field line and is not wired through the refrigeration and low pressure controls. If the refrigeration mechanism becomes inoperative or out of adjustment resulting in too cold a temperature in the storage space, the thermostatic control governing the heater unit will automatically turn on the heater, counteracting the refrigeration effect. Conversely, if the heater unit control should become inoperative or out of adjustment leaning toward too warm a storage temperature, the refrigeration thermostatic control automatically starts in the refrigerating unit.

e. Indicating Dial Thermometer. Installed in the face of the refrigerator door (fig 1, item 3) is an indicating dial thermometer to indicate if the refrigerator is in operating condition.

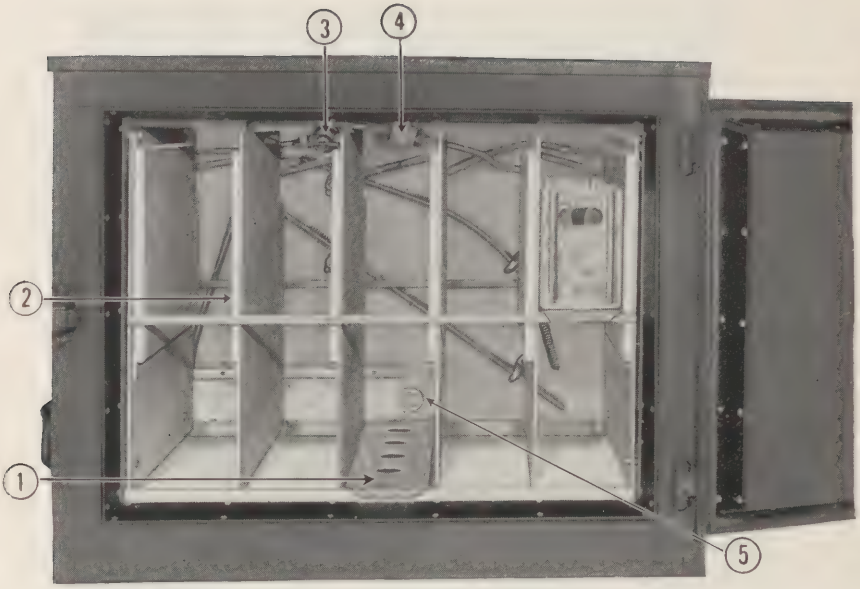


Figure 8. Heating unit and cabinet interior.

	Med. Dept. No.	Nomenclature
1.	*9R27048*	*Shelves, evaporator*
2.	*9R27046*	*Evaporator, complete*
3.	*9R27188*	*Valve, expansion, thermostatic*
4.	*9R27058*	*Clamp, thermostatic*
5.	*9R27054*	*Element, heating*

f. Condensing Unit. The condensing unit (fig 9) is equipped with a ¼ horsepower repulsion induction motor. A vertical reciprocating type compressor is driven by the motor and a V-belt. The receiver is of vertical type and an air-cooled condenser is used. To dissipate the heat from the condenser and the motor, air is drawn into the machine compartment from the rear and discharged through the front by a suction fan mounted on the end of the motor shaft. The mechanical equipment is arranged to facilitate access for service and adjustments.

g. Manual Compartment. A pocket for the service manual, extra belt, oil can, and a brush for cleaning the condenser is attached to the left wall of the machine compartment (fig 6 and 10).

h. Cabinet Serial Number. The cabinet serial number is stamped on the top of the front skid (left-hand corner when facing the cabinet), and can be read from the outside of the refrigerator (fig 11).

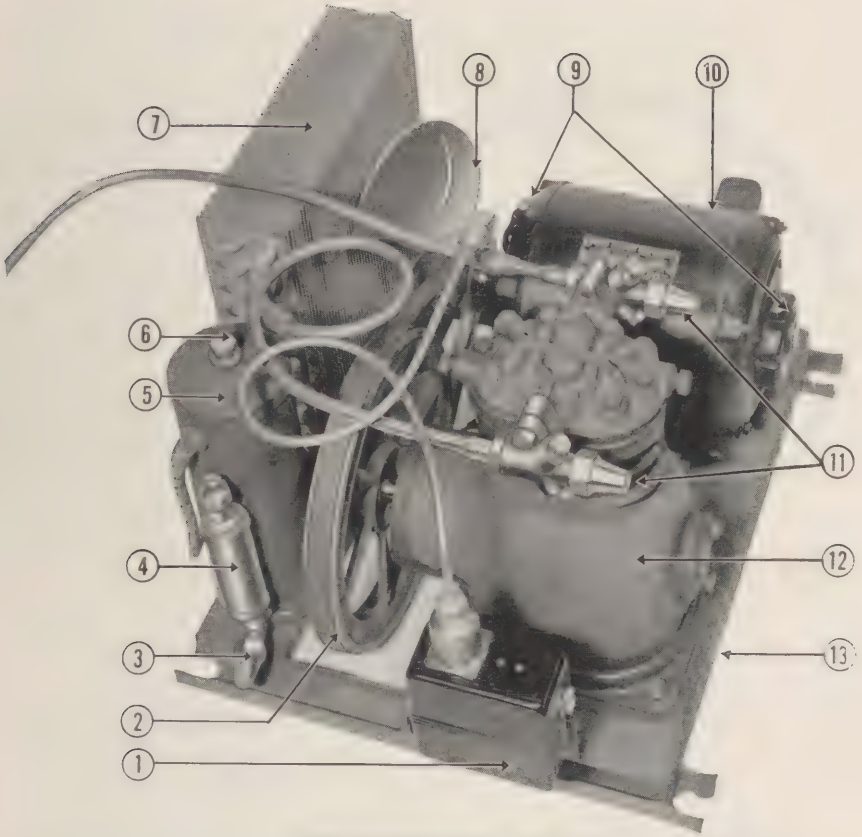


Figure 9. Condensing unit.

	Med. Dept. No.	Nomenclature
1.	9R27202	*Control, low, pressure*
2.	9R27144	*Belt, compressor*
3.	9R27210	*Valve, receiver, liquid*
4.	9R27222	*Dehydrator*
5.	9R27208	*Receiver, liquid*
6.	9R27212	*Plug, fuseable, receiver*
7.	9R27206	*Condenser*
8.	9R27148	*Fan, motor, electric*
9.		*Electric motor oil cups*
10.	9R27152	*Motor, electric, complete*
11.	9R27062	*Valves, service*
12.	9R27060	*Compressor, complete* { *less valves* / *less flywheel* }
13.	9R27204	*Condensing unit, complete*

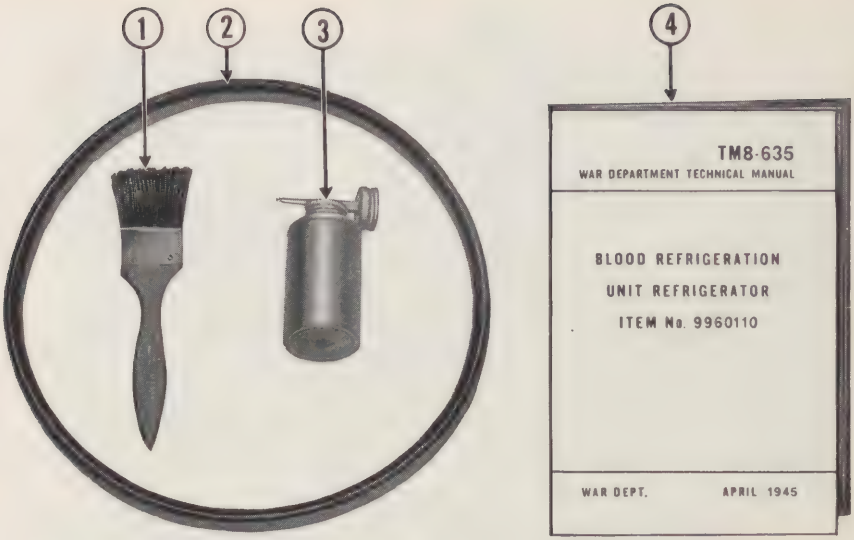


Figure 10. Manual compartment accessories.

	Med. Dept. No.	Nomenclature
1.	*TR01034*	*Brush, hair, 6 inch, handle*
2.	*9R27144*	*Belt, compressor*
3.	*TR02521*	*Oiler, steel, straight spout, ½ pint*
4.	*TM8-635*	*Manual, technical*

Figure 11. Cabinet serial number.

9. DATA

a. Refrigerator Dimensions Overall, Exclusive of Skids:

Width — 36 inches including carrying handles
Height — 43 7/8 inches
Depth — 34 1/2 inches including door latch

b. Overall Dimensions Including Skids:

Height — 45 1/2 inches
Width — 44 inches

c. Inside Dimensions:

Height — 20 3/4 inches
Width — 28 1/2 inches
Depth — 25 inches

d. Overall Shipping Dimensions with Export Packing:

Height — 58 3/4 inches
Width — 51 inches
Depth — 40 1/4 inches

e. Weight:

880 pounds — shipping weight with export packing
568 pounds — net weight less blood and bottles

f. Condensing Unit:

Motor type, repulsion—induction
Motor rating, 1/4 horsepower
Motor voltage, 110 volts, alternating current, 60 cycle
Motor speed, 1725 R.P.M.
Motor pulley diameter, 2 1/4 inches
Compressor flywheel diameter, 9 3/4 inches
Compressor speed, 350 R.P.M.
Cylinder bore and stroke, 1 1/2 inches x 1 1/2 inches
Normal wattage consumption, 340 watts with an evaporator temperature of 39 degrees Fahrenheit, and the surrounding temperature 75 to 80 degrees Fahrenheit
Compressor oil charge, 1 3/4 pints refrigeration oil
Refrigerant charge, Freon 12—2 1/2 pounds

g. Capacity:

Storage capacity, 50 bottles 500 cc or 1000 cc

PART TWO
OPERATING INSTRUCTIONS

Section IV
General

10. SCOPE

a. Part Two contains information for the guidance of the personnel responsible for the operation of this equipment. It contains information on the operation of the equipment together with description and location of various controls and instruments.

b. Failure or unsatisfactory performance of equipment will be reported on W.D., A.G.O. Form 468. If this form is not available see TM 38-250. This form will be made out in duplicate by using or service organization and forwarded in duplicate through command channels to The Surgeon General.

Section V
Service Upon Receipt of Equipment

11. UNCRATING UNIT AND PLACING ACCESSORIES

a. Uncrating the Refrigerator. The crated refrigerator should be moved to the location of operation before being uncrated. When the refrigerator is to be used the crate must be removed (fig 12) and the following steps taken to prepare the refrigerator for operation. To remove the crate proceed as follows:

(1) Remove the 3 steel bands with a pinch bar or similar tool.

(2) With a nail puller remove all nails from the 4 sides and the top.

(3) Remove the packing brace framed around the top of the cabinet.

(4) To remove the refrigerator from the packing base, work from the under side of the base, and by tilting the refrigerator forward and back the 4 J-bolt nuts can be removed, allowing the 4 J-bolts to be free for removal (fig 12, item 1).

(5) With the J-bolts removed, the refrigerator is now free and can be lifted from the packing base.

b. Placing Accessories

(1) Remove the screws from the front and rear machine compartment doors and lift off the doors.

(2) Remove all tape and packing from the controls, motor, junc-

tion box, drain shutoff valve, extension cord plug, and the packing between the compressor flywheel and belt.

(3) Open storage compartment door by removing the pin from the latch and remove the packing from the 10 bottle racks.

(4) Remove the cardboard box containing the brush, oil can and belt (fig 10). Place these articles in the manual compartment (fig 6, item 3) provided for this purpose.

(5) Slide the racks into position between the evaporator plates (fig 2).

(6) Reinstall the rear machine compartment door.

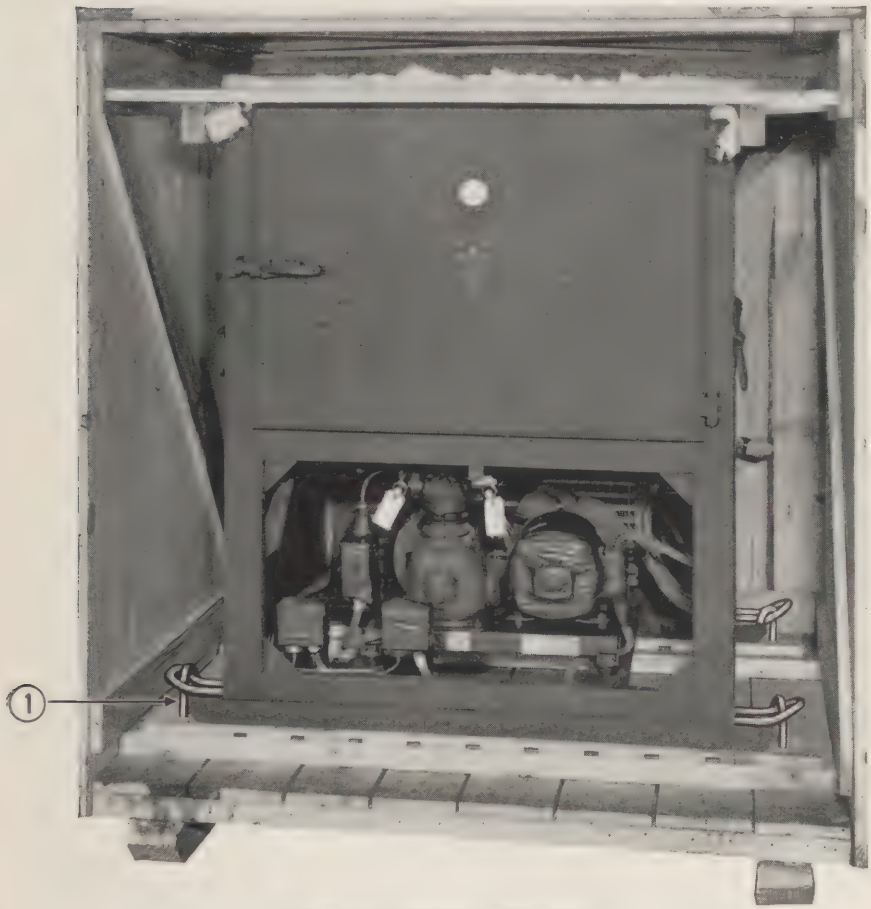


Figure 12. Uncrating refrigerator.

1. J-Bolts

12. PREPARATION OF THE REFRIGERATION SYSTEM

a. The following steps must be taken to prepare the refrigeration system for operation. All 3 valves have been closed for shipment and must be opened before the unit is placed in operation or serious damage will result.

(1) Place the refrigerator in position. To lift, use the 4 handles attached to the cabinet sides. If the refrigerator is installed indoors, air circulation must be provided to the condensing unit. To provide this air circulation install the refrigerator at least 1 foot away from the wall.

(2) Pull the extension cord through the cabinet.

(3) Remove the 3 valve stem caps as indicated by tags (2 on the compressor head and 1 on the liquid receiver valve) (fig 9, items 3 and 11).

(4) Back seat all 3 valve stems to a firm seat. (See par 25.) (Use ratchet wrench, TR02314—not pliers.)

(5) Reinstall valve stem caps (tighten with wrench).

(6) Place 6 drops of "OE 10 engine oil" in oil cups located on each end of the motor (fig 9, item 9).

(7) Electric supply must correspond with voltage and cycle as indicated on name plate attached to the condensing unit (110 volts, alternating current, 60 cycle, 1 phase).

(8) Connect extension cord plug to the source of supply. The unit is now in operation.

(9) Reinstall the front machine compartment door.

Section VI

Controls and Instruments

13. TEMPERATURE CONTROLS

a. The control system consists of 2 thermostatic controls and 1 pressure control (fig 6).

(1) The refrigeration thermostatic control (fig 6, item 2) is set to maintain a temperature from 4 degrees Centigrade (39.2 Fahrenheit) to 8 degrees Centigrade (46.4 Fahrenheit).

(2) The low pressure control (fig 6, item 4) is adjusted to maintain a temperature of approximately 3 degrees Centigrade (37.4 Fahrenheit) to 7 degrees Centigrade (44.6 Fahrenheit).

(3) The heater thermostatic control (fig 6, item 1) is set to maintain a temperature of 2 degrees Centigrade (35.6 Fahrenheit) to 6 degrees Centigrade (42.8 Fahrenheit).

b. Thus it is possible to maintain the temperature at the setting designated on the refrigeration thermostatic control. If the refrigeration thermostatic control fails to open the electrical circuit, the low pressure control will automatically stop the condensing unit. Should the refrigeration thermostatic control and the low pressure control both fail to stop the condensing unit, the heater unit will automatically be put into operation by the heater thermostatic control. If the equipment is subjected to abnormal low temperatures the heater unit will prevent heat leakage from lowering the temperature of the refrigerator compartment to a point of freezing. Control settings are set so as to energize the heater at 2 degrees Centigrade (35.6 Fahrenheit) and shut off the heater at 6 degrees Centigrade (42.8 Fahrenheit).

14. CONTROL ADJUSTMENTS BY OPERATING PERSONNEL

a. The refrigeration thermostatic control and the heater thermostatic control are equipped with finger tip adjustment knobs with limits of 4 degrees Fahrenheit above and 4 degrees Fahrenheit below factory settings. The operating personnel are limited to these adjustments.

b. These adjustment knobs are external and are located on top of the controls. The knobs are equipped with stops to maintain their limits, and no further adjustments than those afforded by the external knobs are to be attempted by the operating personnel. Raising or lowering the temperature setting in this manner does not affect the differential settings.

NOTE: ALTITUDE LOWERS CONTROL SETTINGS 1 DEGREE FAHRENHEIT PER 1000 FEET.

15. THERMOSTATIC EXPANSION VALVE

The thermostatic expansion valve is mounted on the evaporator at the left rear of the cabinet (fig 8, item 3). This valve is adjusted to maintain full refrigeration of the evaporator. The amount of refrigerant entering the evaporator is governed by the temperature of the thermostatic bulb attached to the suction line at a predetermined point for proper control (fig 8, item 4).

16. INSTRUMENTS

The thermometer installed in the face of the refrigerator door is an indicating dial thermometer (fig 1, item 3). The purpose of this thermometer is to indicate if the refrigerator is in operating condition. Temperatures indicated on the dial are those represented from the reaction of the bulb mounted on the inside panel of the door (fig 2, item 2). When the refrigerator is in operation, the indicating hand should be within the range of the operating temperature of the compartment. If the refrigerator door is opened and closed frequently, or if the lapse of time from original start-up is not sufficient for the temperature to reach the predetermined required point, the dial will indicate a temperature higher

than that required for normal operation. Therefore, these conditions must be considered before assuming that the equipment is not operating properly. NO ATTEMPT SHOULD BE MADE TO ADJUST THE CONTROLS USING THE INDICATING DIAL THERMOMETER AS A SETTING INSTRUMENT. THE DIAL THERMOMETER INDICATES ONLY A RELATIVE CONDITION. Although the indicating dial thermometer was properly calibrated at the time it left the factory, its accuracy may be impaired by unusual conditions and handling. However, it is sufficiently rugged to function as an indicating instrument within the limits of its requirements.

Section VII

Operation Under Usual Conditions

17. OPERATION

The operation of the refrigerator is automatic. No attempt should be made to start the condensing unit before the start-up instructions (see par 12) have been read and completely followed. Reinspect to be certain that all 3 valve stems are back to a firm left seat. With the 3 valves opened, the valve stem caps replaced, begin operation by inserting the extension cord plug into 110 volt, alternating current, 60 cycle, 1 phase current supply.

Section VIII

Operation Under Unusual Conditions

18. DUST AND SAND

When operating under extreme dust and sand conditions, the condenser must be inspected and cleaned daily. To clean the condenser see par 29.

19. EXTREME TEMPERATURE CONDITIONS

a. High Temperature Conditions. Under extremely high temperatures caused by the weather or room conditions, the condensing unit will be operating longer cycles than normally. When operating under these extreme conditions, the machine compartment doors may be removed for better circulation of cooling air over the condensing unit.

b. Low Temperature Conditions. If the refrigerator is subjected to abnormal low temperature conditions, the heater thermostatic control will automatically energize the heater unit and prevent heat leakage from lowering the temperature of the refrigerator compartment to a point of freezing.

PART THREE
MAINTENANCE INSTRUCTIONS

Section IX
General

20. SCOPE

Part Three contains information for the guidance of the personnel of the using organizations responsible for the maintenance (1st and 2nd echelon) of this equipment. It contains information needed for the performance of the scheduled lubrication and preventive maintenance services.

Section X
Lubrication

21. GENERAL INSTRUCTIONS

To prevent personal injury, the following precautions must be followed. Before any lubrication is attempted, disconnect the extension cord plug from the source of supply. If the plug is not disconnected, the automatic controls may start the unit at any instant and cause serious injury to the operating personnel reaching around the belt, fan and flywheel.

22. MOTOR LUBRICATION

Once a month, place 6 drops of "OE 10 engine oil" (fig 10, item 3) in the 2 oil cups located on the bearing ends of the electric motor (fig 9, item 9).

23. COMPRESSOR LUBRICATION

It is seldom necessary to add oil to the refrigerating system since the oil is in a closed system at a temperature not conducive to carbonization. Replace oil only if lost by leaks or removal due to replacement of parts. (See par 45.)

Section XI
Preventive Maintenance

24. ORGANIZATIONAL MAINTENANCE (2ND ECHELON)

a. Weekly.

(1) Inspect condenser for foreign substances. (See par 29.)

(2) Inspect evaporator. (See par 28.)

b. Monthly.

(1) Lubricate according to instructions in Section X.

(2) Inspect belt. (See par 33.)

(3) Inspect motor commutator and clean if necessary. (See par 32.)

Section XII

Trouble Shooting

25. VALVES AND GAGES

a. General. In analyzing all problems of refrigeration it is important that the gages be installed to determine what operating conditions exist within the refrigeration system at the time of failure. By studying pressures indicated on the high and low side it is possible to determine the difficulty responsible for the improper operation of the machine.

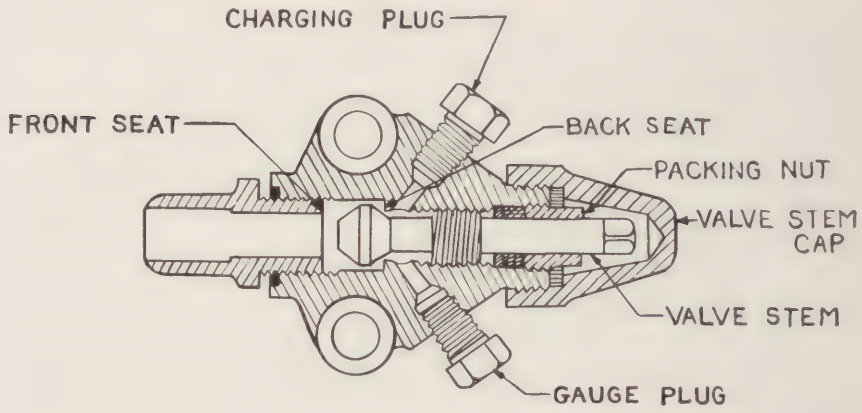


Figure 13. Compressor service valves.

Med. Dept. No.	Nomenclature
9R27062	*Valve, service, compressor*

b. Compressor Service Valves. In order to properly analyze service problems, the mechanic must be familiar with the refrigeration cycle (fig 3). The compressor is equipped with 2 valves—the one on the intake or suction side.of the compressor is called the "suction service valve" (fig 13), and the one on the discharge side of the compressor is called the "discharge service valve" (fig 13). Both valves are equipped with plugs and when the valve stems are turned in a counter clockwise direction termed the "back

seating position," the plug openings are closed. When the valve stems are turned in a clockwise direction termed the "front seating position," the plug openings are open and the valves are closed or seated to the condenser line or the suction line as the case may be. Any intermediate position of the stems other than seating permits the same pressure condition to exist in the gage connection as exists in the part to which the valves are connected.

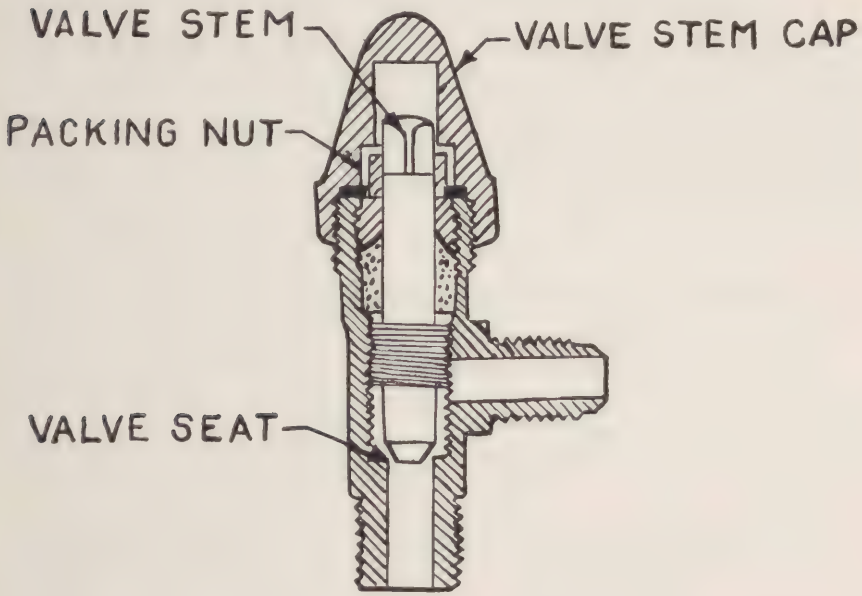


Figure 14. Liquid receiver valve.

Med. Dept. No.	Nomenclature
9R27210	*Valve, receiver, liquid*

c. Liquid Receiver Valve. The liquid receiver is equipped with a shutoff valve (fig 14) that seats or closes in one position. When the valve stem is turned all the way in (clockwise) the valve is closed. When the stem is turned all the way out (counter clockwise) the valve is open.

d. Reading the Gages. By installing the gages (see par 38) it is possible to read the actual pressure conditions that exist in either the low side or the high side (see Pressure Chart, fig 14A). Turn the valves clockwise 1 to 1½ turns in order to get an actual reading condition. Be sure to back seat the valves before installing or removing the gages to prevent the loss of refrigerant.

Air Temperature	Head Pressure	Suction Pressure
80 Degrees	115 Pounds	25 Pounds
90 "	160 "	25 "
100 "	172 "	25 "
110 "	178 "	25 "
110 "	190 "	32 "

Figure 14A. Pressure Temperature Chart

e. Moisture Precaution. The refrigeration system should never be opened under excess pressure or vacuum. Opening under pressure will cause the loss of refrigerant, and opening under a vacuum will draw air into the system. Air contains moisture which will freeze in the orifice of the expansion valve, resulting in service problems difficult to correct. (See par 46.)

26. DIAGNOSIS OF REFRIGERATION TROUBLE

a. Analysis of Symptoms. If the unit does not operate properly, a complete analysis of the system must be made before any adjustments, removal or replacement of parts are attempted. For explanation of refrigeration cycle see fig 3. Before completing diagnosis consider all possible causes to determine whether or not the correct diagnosis has been made.

b. Altitude Effects. If the temperature in the storage compartment is too low, the altitude must be considered as a controlling factor. Although the control settings may be correct, the temperature will vary with the height above sea level. Estimate temperature on basis of control settings allowing 1 degree Fahrenheit drop in temperature for each thousand feet of altitude above sea level. (See par 48 d.)

27. REFRIGERATION TROUBLE CHART

The following trouble chart is for use by the personnel responsible for the 1st and 2nd echelon (operator and organizational) maintenance of this equipment. The chart represents troubles, possible causes, and their remedies. After analyzing the trouble and deciding upon the cause, apply specific remedies recommended. In servicing one part of the equipment be careful not to disturb the adjustment of other components of the unit.

a. Condensing unit does not operate.

Possible Causes	*Possible Remedies*
(1) Extension cord plug not properly plugged in.	Plug in properly.

Possible Causes	*Possible Remedies*
(2) Condensing unit motor overload open.	See par 27 b.
(3) Faulty refrigeration thermostatic or low pressure controls.	Refer to higher echelon.
(4) Expansion valve lost charge.	Refer to higher echelon.
(5) Plugged expansion valve.	Refer to higher echelon.
(6) Expansion valve strainer clogged.	Refer to higher echelon.
(7) Filter built within the dehydrator is plugged.	Refer to higher echelon.
(8) Loss of refrigerant charge.	Refer to higher echelon.
(9) Motor brushes worn.	Replace motor brushes. (See par 31.)
(10) Dirty commutator.	Clean commutator. (See par 32.)

b. Condensing unit motor overload protector switch cuts out.

Possible Causes	*Possible Remedies*
(1) Motor field coils or armature shorted.	Refer to higher echelon.
(2) Low voltage.	Correct voltage is 110 AC, 60 cycle, 1 phase.
(3) Lack of lubrication to motor bearings.	Oil bearings once each month. (See par 22.)
(4) Belt too tight.	Adjust belt tension. (See par 33.)
(5) Leaking reed valves.	Refer to higher echelon.

c. Condensing unit operates but no refrigeration takes place.

Possible Causes	*Possible Remedies*
(1) Belt slipping.	Adjust belt tension. (See par 33.)
(2) Leaking reed valves.	Refer to higher echelon.
(3) Shortage of refrigerant.	Refer to higher echelon.
(4) Faulty expansion valve.	Refer to higher echelon.
(5) Air in condenser.	Refer to higher echelon.

Possible Causes	*Possible Remedies*
(6) Excessive refrigerant charge.	Refer to higher echelon.
(7) Inefficient compressor due to lack of lubrication.	Refer to higher echelon.

d. Excessive head pressure.

Possible Causes	*Possible Remedies*
(1) Air in the system.	Refer to higher echelon.
(2) Condenser blocked with dirt.	Clean condenser. (See par 29.)
(3) Excessive charge of refrigerant.	Refer to higher echelon.

e. Condensing unit operates continuously.

Possible Causes	*Possible Remedies*
(1) Shortage of refrigerant.	Refer to higher echelon.
(2) Leaking reed valves.	Refer to higher echelon.
(3) Excessive charge of refrigerant.	Refer to higher echelon.

f. Suction line frosts back to compressor.

Possible Causes	*Possible Remedies*
(1) Expansion valve out of adjustment, passes too much refrigerant.	Refer to higher echelon.
(2) Leaking expansion valve does not close during off cycles.	Refer to higher echelon.
(3) Reed valve leaking, gas condensing on low side during off cycles.	Refer to higher echelon.
(4) Refrigeration thermostatic control set too cold due to altitude.	Reset warmer-external adjustment only. (See par 30.)
(5) Expansion valve stuck open.	Refer to higher echelon.

g. Condensing unit short cycling.

Possible Causes	*Possible Remedies*
(1) Short of refrigerant.	Refer to higher echelon.
(2) Leaking reed valves.	Refer to higher echelon.

Possible Causes	*Possible Remedies*
(3) Motor overload protector switch cycling on and off.	See par 27 b.
(4) Suction line partially restricted due to kinked and collapsed tubing.	Refer to higher echelon.
(5) Dehydrator restricted.	Refer to higher echelon.
(6) Moisture in refrigeration system.	Refer to higher echelon.
(7) Low pressure control not set properly.	Refer to higher echelon.
(8) Expansion valve or expansion valve strainer restricted.	Refer to higher echelon.

h. Refrigeration not uniform at evaporator plates.

Possible Causes	*Possible Remedies*
(1) Leaking reed valves.	Refer to higher echelon.
(2) Controls out of adjustment.	Refer to higher echelon.
(3) Shortage of refrigerant.	Refer to higher echelon.
(4) Condensing unit operates continuously.	Refer to higher echelon.
(5) Expansion valve bulb loose in clamp on suction line.	Tighten bulb clamp. (See par 34.)
(6) Expansion valve does not close.	Refer to higher echelon.

Section XIII

Maintenance Operations

28. INSPECTING AND DEFROSTING EVAPORATOR

a. Inspecting. Inspect the evaporator once each week to note if any frost or ice is accumulating. Under normal conditions, ice or frost should not accumulate; however, if it has, disconnect the electric service allowing frost to melt to insure free movement of the bottle racks. The defrost water can be drained through the machine compartment by opening the drain shutoff valve (fig 6, item 5). During the period required to remove the frost it will not be necessary to leave the door of the refrigerator compartment open. The cool temperature of the compartment is main-

tained and the resultant temperature rise will not be beyond the safety margin if operation of the unit is resumed as soon as the cooling plates of the evaporator are clear. Always close the drain valve after defrosting.

29. INSPECTING AND CLEANING CONDENSER

To clean the condenser remove the rear machine compartment door and remove all foreign substances from the condenser. A small brush located on the right side of the machine compartment (fig 10, item 1) is provided for this purpose. After using the brush be sure it is returned to the manual compartment.

30. RESETTING REFRIGERATION THERMOSTATIC CONTROL

This control (fig 30) is equipped with a finger tip adjustment knob with limits to the user of 4 degrees Fahrenheit above and 4 degrees Fahrenheit below normal settings. The control knob (fig 30, item 3) is on the outside of the control. The adjustment knob is equipped with stops to maintain the limits of the setting. In making adjustments with the knob the temperature differential is constant.

31. REPLACING MOTOR BRUSHES

a. Removing. Worn motor brushes are indicated by sluggish starting, excessive arcing or failure to start the motor. To remove the motor brushes proceed as follows:

(1) Disconnect the extension cord plug from the source of supply.

(2) Remove the 4 nuts from the end plate bolts.

(3) Remove the end plate by tapping around the flange until plate is free and can be removed from the shaft.

(4) Lift brush holder spring and move to one side freeing brushes for removal. (BRUSHES MUST ALWAYS BE REPLACED IN SETS OF 4 — 2 PAIRS.)

b. Installing. To install the new brushes proceed as follows:

(1) Insert the new brushes in the brush holder and bend the brush holder springs in position so they rest on top of the brushes.

(2) Reinstall end plate on shaft by guiding the index plate through the slot in the brush holder.

(3) Tap flange to secure the end plate to the motor frame and install nuts on the end plate bolts. Tighten the bolts uniformly by alternating from side to side. In tightening the bolts inspect the armature for free movement at intervals to assure proper alinement. Should the end plate fail to aline properly by tightening the bolts, tap lightly around the flange of the end plate until it fits snugly against the motor frame.

(4) Reconnect the extension cord plug to the source of supply.

32. INSPECTING AND CLEANING MOTOR COMMUTATOR

The motor commutator will require cleaning due to accumulation of oil and dust. Excessive arcing and sluggish starting are the results of this condition. To clean the commutator proceed as follows:

(1) Remove the inspection cover plate (item 1) on the end plate of the motor (fig 63).

(2) With the motor in operation gently hold a piece of fine grade sandpaper against segments of the commutator long enough to remove the dirt accumulation. (DO NOT USE EMERY PAPER.)

(3) Reinstall the inspection cover plate and secure with 2 screws.

33. INSPECTING AND ADJUSTING BELT

a. Adjusting. The belt should last an indefinite length of time if it has been operated under proper tension and the pulley is in proper alinement. Oil or lubricants of any kind should not be applied to the belt, and in the event that a slight stretching has occurred, the belt can easily be adjusted and the slack taken up. To adjust the belt tension proceed as follows:

(1) The tension of the belt should permit a depression of about ½ inch midway between pulleys as indicated in fig 43.

(2) Loosen the 4 nuts at the base of the motor and slide the motor away from the compressor to increase the tension, and toward the compressor to decrease the tension.

(3) Square the motor with the condensing unit base to secure proper alinement.

(4) Tighten the 4 nuts at the base of the motor.

b. Removing. To remove the belt proceed as follows:

(1) Disconnect the extension cord plug from the source of supply.

(2) Working from the front of the cabinet, grasp the compressor flywheel with the left hand at the upper portion of the outer edge.

(3) With the right hand guide the belt toward the rear of the cabinet (away from the compressor).

(4) With the left hand rotate the flywheel counter clockwise.

(5) As the belt frees from the flywheel, slip it over the motor pulley and fan, and remove the belt from the unit compartment.

c. Installing. To install the belt proceed as follows:

(1) Place one loop of the belt over the fan and fit into the motor pulley.

(2) Start the belt in the groove on top of the flywheel.

(3) With the right hand guide the belt at the top of the flywheel, and with the left hand guide the belt into position rotating flywheel counter clockwise.

(4) Adjust the belt for proper tension. (See par 33 a.)

34. TIGHTENING THERMOSTATIC BULB CLAMP

Secure the thermostatic bulb under the clamp at former location on the suction line between the center evaporator plates (fig 36) and tighten screws on clamp.

PART FOUR
AUXILIARY EQUIPMENT
Section XIV
General

35. BLOOD REFRIGERATION UNIT GENERATOR

Medical Department item No. 9960105, Unit, Blood Refrigeration, generator, is supplied with the refrigerator as an auxiliary electrical power supply. Instructions on the operation, maintenance and repair of the generator will be covered by a seperate Technical Manual on item No. 9960105.

PART FIVE
REPAIR INSTRUCTIONS

Section XV
General

36. SCOPE

These instructions are published for the information and guidance of the maintenance personnel responsible for the third and higher echelons of maintenance of this equipment. They contain information on the maintenance of the equipment which is beyond the scope of the tools, equipment or supplies normally available to the using organizations.

Section XVI
Trouble Shooting

37. REFRIGERATION TROUBLE CHART

The following trouble chart is for use by the personnel responsible for third and higher echelon maintenance of this equipment. The chart represents troubles, possible causes, and their remedies. After analyzing the trouble and deciding upon the cause, apply specific remedies recommended. In servicing one part of the equipment be careful not to disturb the adjustment of other components of the unit.

a. Condensing unit does not operate.

Possible Causes	*Possible Remedies*
(1) Open circuit.	Inspect for electrical continuity. See Wiring Diagram, fig 5.
(2) Condensing unit motor overload open.	See par 37 b.
(3) Faulty refrigeration thermostatic, or low pressure controls.	Replace refrigeration thermostatic, or low pressure control. (See par 48.)
(4) Expansion valve lost charge.	Replace expansion valve. (See par 50.)
(5) Plugged expansion valve.	Blow out expansion valve. (See par 50.)
(6) Expansion valve strainer clogged.	Clean. (See par 50 g.)
(7) Filter built within the dehydrator is plugged.	Replace dehydrator. (See par 46 b.)

Possible Causes	*Possible Remedies*
(8) Loss of refrigerant charge.	Inspect for leak. (See par 40.) Repair leak. Recharge system. (See par 44 a.)
(9) Motor brushes worn.	Replace motor brushes. (See par 31.)
(10) Dirty commutator.	Clean commutator. (See par 32.)

b. Condensing unit motor overload protector switch cuts out.

Possible Causes	*Possible Remedies*
(1) Motor field coils or armature shorted.	Replace motor field coils or armature. (See par 58 e and 58 h.)
(2) Low voltage.	Correct voltage is 110 AC, 60 cycle, 1 phase.
(3) Lack of lubrication to motor bearings.	Oil bearings once each month. (See par 22.)
(4) Belt too tight.	Adjust belt tension. (See par 33.)
(5) Leaking reed valves.	Replace reed valves. (See par 52.)

c. Condensing unit operates but no refrigeration takes place.

Possible Causes	*Possible Remedies*
(1) Belt slipping.	Adjust belt tension. (See par 33.)
(2) Leaking reed valves.	Replace reed valves. (See par 52.)
(3) Shortage of refrigerant.	Add refrigerant. (See par 44.)
(4) Faulty expansion valve.	Replace expansion valve. (See par 50 f and 50 h.)
(5) Air in condenser.	Purge air from condenser and receiver. (See par 43.)
(6) Excessive refrigerant charge.	Purge out excessive charge.
(7) Inefficient compressor due to lack of lubrication.	Add refrigerant compressor lubricating oil (OR) to the compressor. (See par 45.)

d. Excessive head pressure

Possible Causes	*Possible Remedies*
(1) Air in the system.	Purge air. (See par 43.)
(2) Condenser blocked with dirt.	Clean condenser. (See par 29.)
(3) Excessive refrigerant charge.	Purge out excessive charge.

e. Condensing unit operates continuously.

Possible Causes	*Possible Remedies*
(1) Shortage of refrigerant.	Add refrigerant. (See par 44.)
(2) Leaking reed valves.	Replace reed valves. (See par 52.)
(3) Excessive charge of refrigerant.	Purge out excessive charge.

f. Suction line frosts back to compressor.

Possible Causes	*Possible Remedies*
(1) Expansion valve out of adjustment, passes too much refrigerant.	Reset the expansion valve. (See par 50 e.)
(2) Leaking expansion valve—does not close during off cycles.	Replace expansion valve. (See par 50 f and 50 h.)
(3) Reed valve leaking, gas condensing on low side during off cycles.	Replace reed valves. (See par 52.)
(4) Expansion valve stuck open.	Remove moisture from system if present. See par 46 or replace expansion valve if faulty. (See par 50 f.)

g. Condensing unit short cycling.

Possible Causes	*Possible Remedies*
(1) Short of refrigerant.	Inspect for leaks and repair. See par 40. Add necessary refrigerant. (See par 44 a.)
(2) Leaking reed valves.	Replace reed valves. (See par 52.)
(3) Suction line partially restricted due to kinked and collapsed tubing.	Remove restriction or install new suction line. Purge air. (See par 43.)

Possible Causes	*Possible Remedies*
(4) Dehydrator restricted.	Replace dehydrator. (See par 46 b.)
(5) Moisture in refrigeration system.	Remove moisture. (See par 46.)
(6) Low pressure control not set properly.	Reset low pressure control. (See par 48 k.)
(7) Expansion valve or expansion valve strainer restricted.	Clean valve and strainer or replace valve. (See par 50.)

h. Refrigeration not uniform at evaporator plates.

Possible Causes	*Possible Remedies*
(1) Leaking reed valves.	Replace reed valves. (See par 52.)
(2) Controls out of adjustment.	Adjust controls. (See par 48.)
(3) Shortage of refrigerant.	Add necessary refrigerant. (See par 44 a.)
(4) Expansion valve does not close.	Replace expansion valve. (See par 50 f and 50 h.)

Section XVII

Repair of Refrigeration System

38. INSTALLING THE GAGES

a. Installing the Compound Gage. The compound gage is calibrated from 30 inches of vacuum to 60 pounds per square inch pressure. To install the compound gage proceed as follows: (fig 15).

(1) Locate the suction service valve (fig 15, item 3) attached to the head of the compressor and connected to the 3/8 inch suction line.

(2) Remove the valve stem cap.

(3) Make certain that the valve is back seated.

(4) Remove the lower pipe plug from the valve.

(5) Connect the compound gage (fig 15, item 4) in the plug opening. (Screw in gage until gas tight.)

(6) To read gage, open valve by turning stem 1 turn in a clockwise direction. (Gage will now indicate pressure on the low side of the system.)

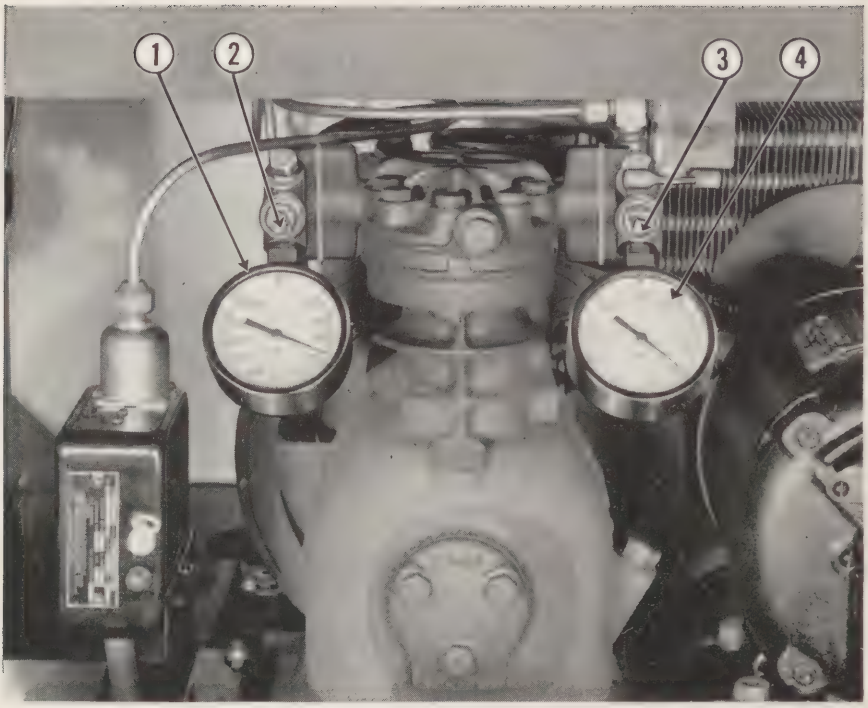


Figure 15. Gages installed.

	Med. Dept. No.	Nomenclature
1.	*9R27250*	*Gage, pressure*
2.	*9R27062*	*Valve, service, compressor (discharge)*
3.	*9R27062*	*Valve, service, compressor (suction)*
4.	*9R27252*	*Gage, compound*

b. Installing the Pressure Gage. The pressure gage is calibrated from 0 to 300 pounds per square inch pressure. To install the gage on the compressor proceed as follows:

(1) Locate discharge service valve (fig 15, item 2) attached to the head of the compressor and connected to the condenser.

(2) Remove the valve stem cap.

(3) Make certain that the valve is back seated.

(4) Remove the lower pipe plug from the valve.

(5) Connect the pressure gage (fig 15, item 1) in the plug opening. (Screw in gage until gas tight.)

(6) To read gage, open valve by turning stem 1 turn in a clockwise direction. (Gage will now indicate pressure on the high side of the system.)

39. OPERATING THE LEAK DETECTOR

a. Filling Leak Detector. The leak detector when filled and properly used will accurately detect the presence of Freon 12 refrigerant. To fill the leak detector proceed as follows: (fig 16).

(1) Open the fuel tank by removing the base. Fill the tank with plain uncolored gasoline. Do not use alcohol or colored gasolines because these fuels may cause the detector to become clogged. The tank should be filled slowly in order to permit the wick in the tank to soak up the gasoline. Too rapid filling will reduce the amount of charge and materially cut down the burning time of the leak detector. Screw the base on tightly so the fuel will not leak out.

(2) See that the regulating valve is shut by turning the regulating valve hand wheel all the way to the right.

(3) Stand the detector upright and fill the priming cup about ½ full with white gasoline and ignite.

(4) After the priming fuel has burned out, open the regulating valve hand wheel slightly and touch a lighted match to a hole in the burner tube.

(5) The vapor in the burner tube will ignite causing a hissing noise. Pressure and heat have been produced in the fuel tank by the heat and the burning gasoline in the priming cup. Gasoline from the fuel tank has vaporized under this heat and burns in the tube.

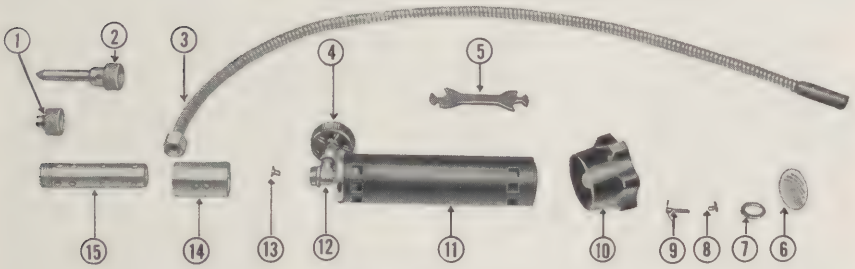


Figure 16. Leak detector.

Nomenclature

1. *Flame reducer*
2. *Soldering point*
3. *Sampling hose*
4. *Regulating valve hand wheel*
5. *Valve wrench*
6. *Brass plate*
7. *Gasket*
8. *Burner tip*
9. *Tip cleaner*
10. *Base*
11. *Fuel tank*
12. *Priming cup*
13. *Burner tip*
14. *Sampling hose brass coupling*
15. *Burner tube*

b. Using the Leak Detector. To use the leak detector proceed as follows:

(1) Permit the detector to burn 2 or 3 minutes with a low flame.

(2) Adjust the flame by regulating the valve hand wheel making the flame visible but not flaring out at the top and sides of the burner tube.

(3) Pass the rubber end of the sampling hose over the refrigeration system (fig 17). When the hose comes in contact with a leaking part or connection, the Freon 12 refrigerant is drawn through the hose and turns the flame to a bright green. When the leaking refrigerant is no longer drawn into the sampling hose the flame resumes its blue color. The sampling hose then has passed beyond the leaking connection or part from which the refrigerant is escaping.

(4) When testing for very small leaks, throttle the flame to produce a more sensitive reaction.

(5) To extinguish the detector, close the regulating valve by turning hand wheel to a firm right seat and permit to cool.

(6) The detector will normally require filling after 45 minutes of operation.

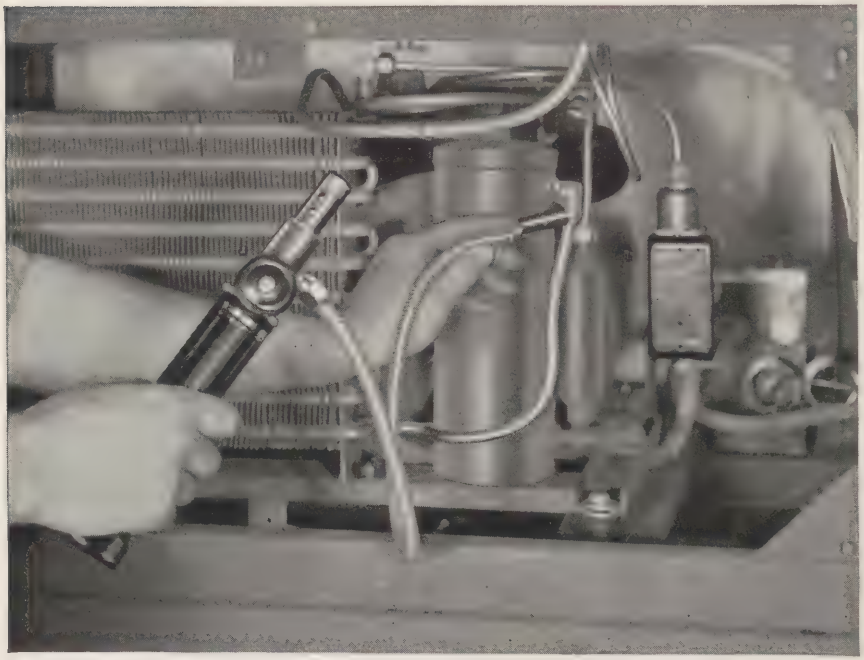


Figure 17. Testing for leaks.

c. *Cleaning the Detector.* To clean the leak detector proceed as follows: (fig 16).

(1) To clean the burner tip remove the tip from the detector using the wrench provided for this purpose.

(2) Insert tip cleaner wire in large opening of tip and force through burner tip hole. (Tip cleaner, extra tip and gasket will be found in the bottom of the base under the round brass plate.)

(3) Keep the holes in the burner tube clear of soot.

(4) Make sure that the burner tube is screwed down tightly on the detector and there is no leakage around the regulating valve.

d. *Using Leak Detector as a Blow Torch.* To use the leak detector as a blow torch proceed as follows: (fig 16).

(1) Unscrew and remove the burner tube from the detector.

(2) Remove the brass coupling that holds the sampling hose by slipping the coupling off the burner tube.

(3) Reinstall the burner tube and screw it down tightly. The leak detector can now be used as a blow torch.

(4) Fill the detector as outlined in par 39 a.

(5) If a narrow flame is desired screw the flame reducer on the end of the burner tube.

e. *Using Leak Detector as a Soldering Iron.* To use the leak detector as a soldering iron proceed as follows:

(1) Screw the soldering point on the end of the burner tube.

(2) Fill the detector as outlined in par 39 a.

(3) Allow the detector to burn 3 minutes after lighting in order to heat the copper soldering point so that it will be hot enough for soldering.

40. TESTING FOR LEAKS

a. All refrigeration parts and connections must be gas tight to prevent the loss of the Freon 12 refrigerant from the system. Should the diagnosis indicate that a leak has developed, the system should be tested by the following procedure:

(1) Install the gages. (See par 38.)

(2) Disconnect the extension cord plug and permit the pressure on the low side of the system to build up to at least 25 pounds.

(3) Fill the leak detector and place in operation as outlined in par 39 a.

(4) Pass rubber end of the sampling hose over parts of the refrigeration system including fittings, compressor shaft seal, and all

connections. Note detector flame reaction to indicate the presence of a leak. (See par 39 b (3).)

(5) Correct leaks found by repairing or replacing parts or connections.

(6) Clear the air around the points where the leak was detected and retest for leaks after repairs have been made.

(7) To test for leaks should the detector not be available, apply a soap and water lather to the fittings, compressor shaft seal and all connections.

(8) After applying the lather, inspect closely for bubble or bubbling to indicate the presence of a leak.

(9) All leaks must be corrected regardless of how small they may be.

41. PUMPING DOWN THE SYSTEM

a. In order to open the refrigeration system to the atmosphere for the removal or replacement of parts, it is imperative that the system be pumped down. This procedure isolates the entire refrigerant charge from the rest of the system and keeps it contained in the liquid receiver and the condenser. To pump down the system proceed as follows:

(1) Install the gages. (See par 38.)

(2) Locate the liquid receiver valve attached to the receiver (fig 9, item 3).

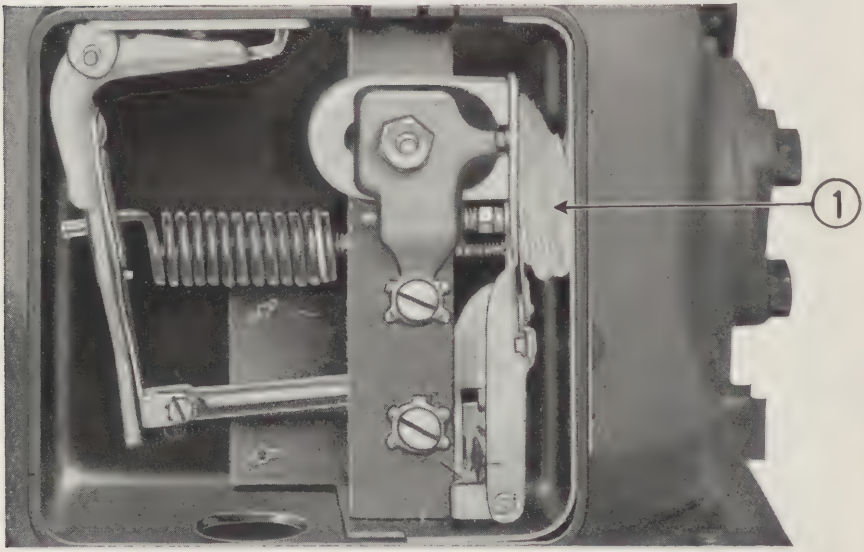


Figure 18. Blocking the low pressure control.

1. Wood block

(3) Remove the valve stem cap.

(4) Close the valve.

(5) Operate the compressor continuously until the pressure indicated on the compound gage is zero. IT WILL BE NECESSARY TO BLOCK THE LOW PRESSURE CONTROL CONTACT POINTS BY REMOVING THE CONTROL COVER PLATE AND WEDGING A PIECE OF WOOD BETWEEN THE INNER CASE OF THE CONTROL AND THE CONTACT ARM AS INDICATED IN FIG 18.

(6) Permit compressor to stop. The pressure on the compound gage will rise.

(7) Operate the compressor intermittently until the pressure is stationary at 1 pound when the compressor is not operating.

(8) Front seat the discharge service valve.

(9) Front seat the suction service valve.

(10) The system is now pumped down and the refrigerant is isolated in the liquid receiver tank and the condenser.

42. BALANCING THE PRESSURE FOR COMPRESSOR REPAIRS

a. To open the compressor body to the atmosphere the refrigerant in the compressor body must be evacuated and the pressure balanced. To balance the pressure proceed as follows:

(1) Install the gages. (See par 38.)

(2) Locate the suction service valve attached to the compressor (fig 15).

(3) Remove the valve stem cap.

(4) Front seat the valve.

(5) Permit the compressor to operate until the pressure indicated on the compound gage is 0. It will be necessary to manually close the low pressure control contact points by removing the control cover plate and manually depressing the lever as indicated in fig 19.

(6) Disconnect the extension cord plug from the source of supply.

(7) Remove the valve stem cap and front seat the discharge service valve (fig 15, item 2).

(8) The following services can now be performed without removing the compressor body from the unit compartment:

(a) Replace or repair valve plate assembly.

(b) Inspect oil level.

(c) Add oil to the compressor.

(d) Remove suction line strainer for cleaning.

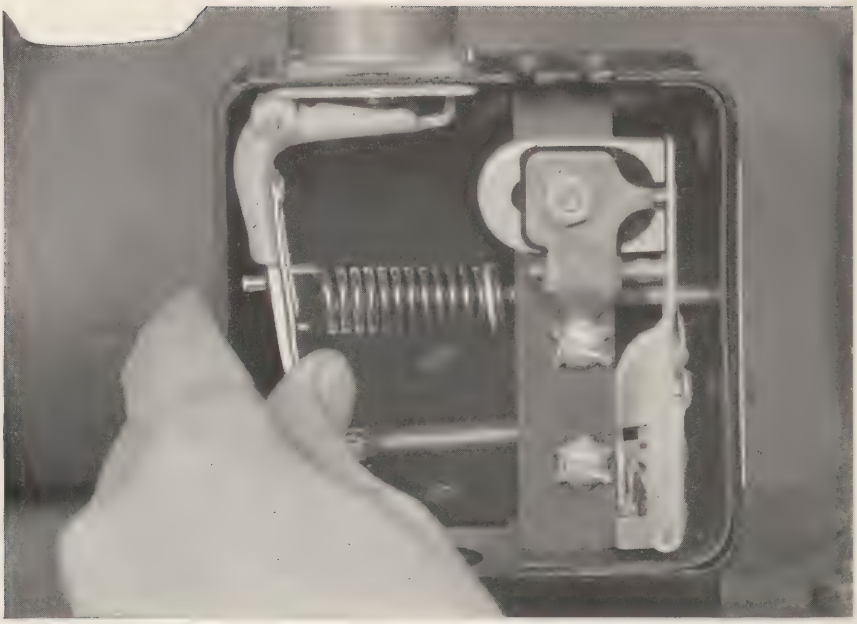


Figure 19. Manually closing low pressure control.

43. PURGING AIR FROM THE SYSTEM

a. Purging the Compressor. After the compressor has been opened to the atmosphere, a small amount of air will be trapped within when reassembled. This air must be removed from the compressor. To purge the compressor proceed as follows:

(1) With the suction and discharge service valves front seated, remove the pressure gage from the discharge service valve (fig 15).

(2) Turn the suction service valve ½ turn counter clockwise.

(3) Rotate the compressor flywheel by hand 2 complete revolutions. This action will purge the trapped air from the compressor through the gage opening in the discharge service valve out into the atmosphere.

b. Purging the Low Side of the System. Should the low side of the system be opened to the atmosphere, the air trapped within the low side during reassembling must be removed (see Chart, fig 4, for explanation of parts on low side). To purge the low side of the system proceed as follows:

(1) Install the compound gage. (See par 38.)

(2) Front seat the discharge service valve.

(3) Remove pressure gage or gage plug.

(4) Block the low pressure control contact points by removing the control cover plate and wedging a piece of wood between

the inner case of the control and the contact arm as indicated in fig 18.

(5) Permit the unit to operate for a period of 5 minutes under at least a 20-inch vacuum. During this period the trapped air in the low side of the system is being discharged through the gage plug opening in the discharge service valve to the atmosphere.

(6) After 5 minutes of operation reinstall the gage plugs on the discharge service valve while the unit is still operating.

(7) Disconnect the extension cord plug from the source of supply.

(8) Remove the wooden wedge from the low pressure control and reinstall the control cover.

(9) Back seat both the discharge and the suction service valves.

(10) Remove the compound gage and reinstall the gage plug and valve caps.

(11) Open the liquid receiver valve, and replace valve cap.

(12) Reconnect the extension cord plug to the source of supply. The unit is now in operation.

c. *Purging the Entire Refrigeration System.* Should repairs necessitate the removal of the entire charge of refrigerant, the air trapped within the system must be removed after the installation of the new parts. This is accomplished by purging the entire refrigeration system from the discharge service valve through the condenser, liquid receiver, evaporator, and compressor. To purge the entire refrigeration system proceed as follows:

(1) Remove the valve stem cap and open the liquid receiver valve to a firm back seat (fig 9).

(2) Remove the valve stem cap and back seat the suction service valve (fig 15).

(3) Remove the lower gage plug and install the compound gage (screw in gas tight).

(4) Turn the suction service valve 2 complete turns (clockwise).

(5) Front seat the discharge service valve.

(6) Remove the lower gage plug.

(7) Allow the compressor to operate continuously until the suction pressure indicates 20 inches of vacuum on the compound gage. IT WILL BE NECESSARY TO BLOCK THE LOW PRESSURE CONTROL CONTACT POINTS BY REMOVING THE CONTROL COVER PLATE AND WEDGING A PIECE OF WOOD BETWEEN THE INNER CASE OF THE CONTROL AND THE CONTACT ARM AS INDICATED IN FIG 18.

(8) With a 20-inch vacuum maintained permit the unit to operate for a period of 20 minutes, assuring the removal of all air from the system. During this period, the trapped air in the system is being discharged through the gage plug opening in the discharge service valve to the atmosphere.

(9) After operating the unit for the time specified above, reinstall the gage plug in the discharge service valve, and at the same time, remove the wooden wedge from the low pressure control. With the wedge removed, the deep vacuum now maintained will allow the contact points on the low pressure control to open, breaking the electrical circuit to the motor stopping the unit.

(10) Back seat both the suction and discharge service valves.

(11) Reinstall cover on low pressure control.

(12) Remove upper gage plug from the suction service valve, and charge the system with Freon 12 refrigerant as outlined in par 44.

44. ADDING AND REMOVING REFRIGERANT FROM THE SYSTEM

a. Adding Refrigerant to the System. Refrigerant lost by leaks or by the replacement of parts must be restored to the system to maintain proper refrigeration. To add refrigerant proceed as follows: (fig 20).

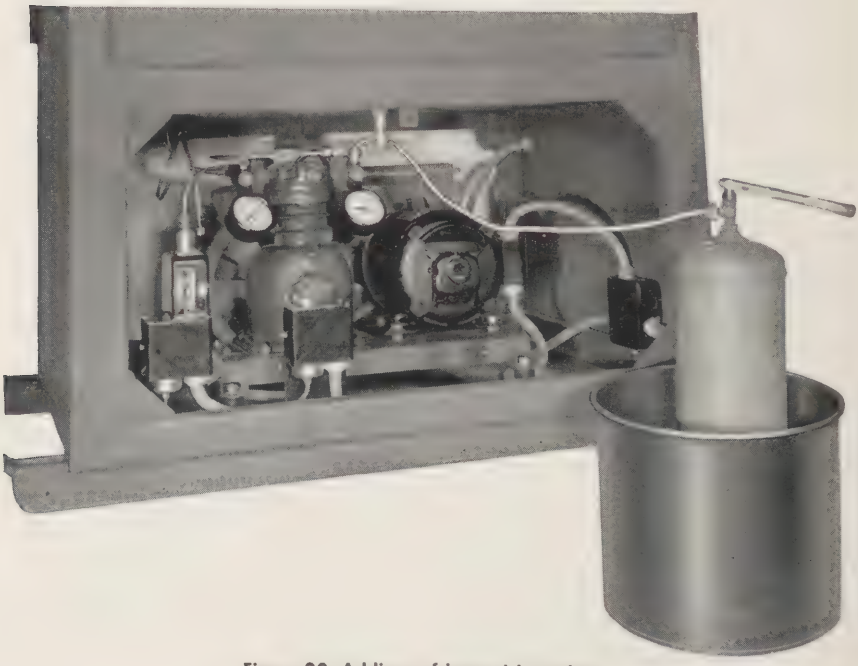


Figure 20. Adding refrigerant to system.

(1) Install gages. (See par 38.)

(2) Back seat the suction service valve and remove the upper gage plug.

(3) Install a 1/8 inch pipe to a 1/4 inch flare connector in the plug opening.

(4) Connect a 1/4 inch charging line from the connector to a refrigerant supply cylinder. Leave the 1/4 inch flare nut attached to the connector loosely coupled.

(5) Place supply cylinder in a pail of hot water keeping cylinder in an upright position.

(6) Purge the charging line by slightly opening and immediately closing the valve on the supply cylinder.

(7) Tighten 1/4 inch flare nut attached to the connector.

(8) Turn the suction service valve 2 complete revolutions (clockwise).

(9) Open the supply cylinder valve and permit unit to cycle until the correct amount of refrigerant has been added. DETERMINE THE NORMAL CHARGE OF REFRIGERANT FROM THE PRESSURE TEMPERATURE CHART. (FIG 14A). A FULL CHARGE OF FREON 12 REFRIGERANT IS 2½ POUNDS.

(10) After the correct amount has been added, close the valve on the supply cylinder and back seat the suction and discharge service valves. Remove the charging line, connector, and gages. Reinstall gage plugs and valve caps.

b. Removing Refrigerant from the System. To remove or replace any parts on the high side of the refrigeration system (fig 4), the complete charge of refrigeration must be removed from the system into an empty service cylinder. (Fig 21.) To remove the refrigerant proceed as follows:

(1) Pump down the system. (See par 41.)

(2) Unscrew the 1/4 inch flare nut on the liquid line valve connected to the top of the dehydrator and remove the liquid line (fig 21).

(3) Connect a 1/4 inch discharge line to the dehydrator and connect the opposite end of the discharge line to the service cylinder leaving this connection loosely coupled.

(4) Purge the discharge line from the dehydrator to the service cylinder by slightly opening and immediately closing the liquid receiver valve.

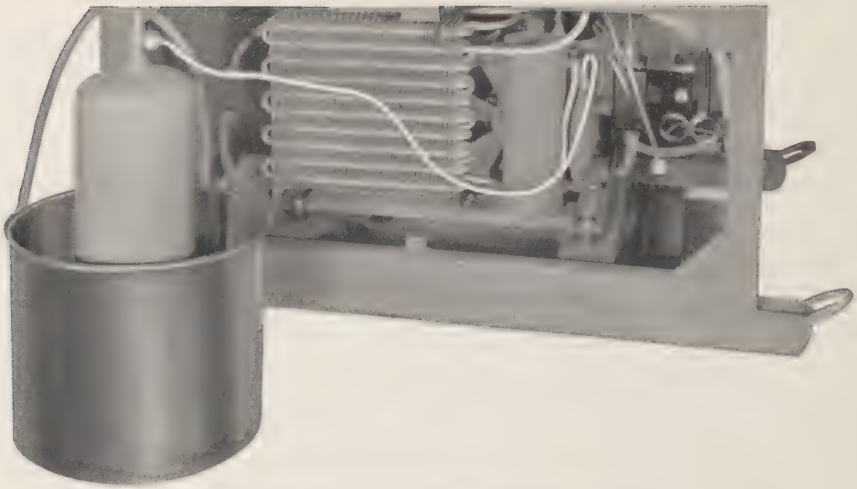


Figure 21. Removing refrigerant from system.

(5) Tighten the fittings on the cylinder and open cylinder valve.
(6) Open the liquid receiver valve.
(7) Place the service cylinder in a pail of cold water to lower its temperature below that of the liquid receiver tank.
(8) Allow 10 minutes for the transfer of the refrigerant, then close the liquid receiver valve and remove the charging line from the dehydrator.

Figure 22. Inspecting oil level.

45. ADDING OIL TO THE COMPRESSOR

a. It is seldom necessary to add oil to the compressor since the oil is in a closed system at a temperature not inducive to carbonization. Only replace oil if lost through leaks or replacement of parts. To add oil to the compressor proceed as follows: (fig 23).

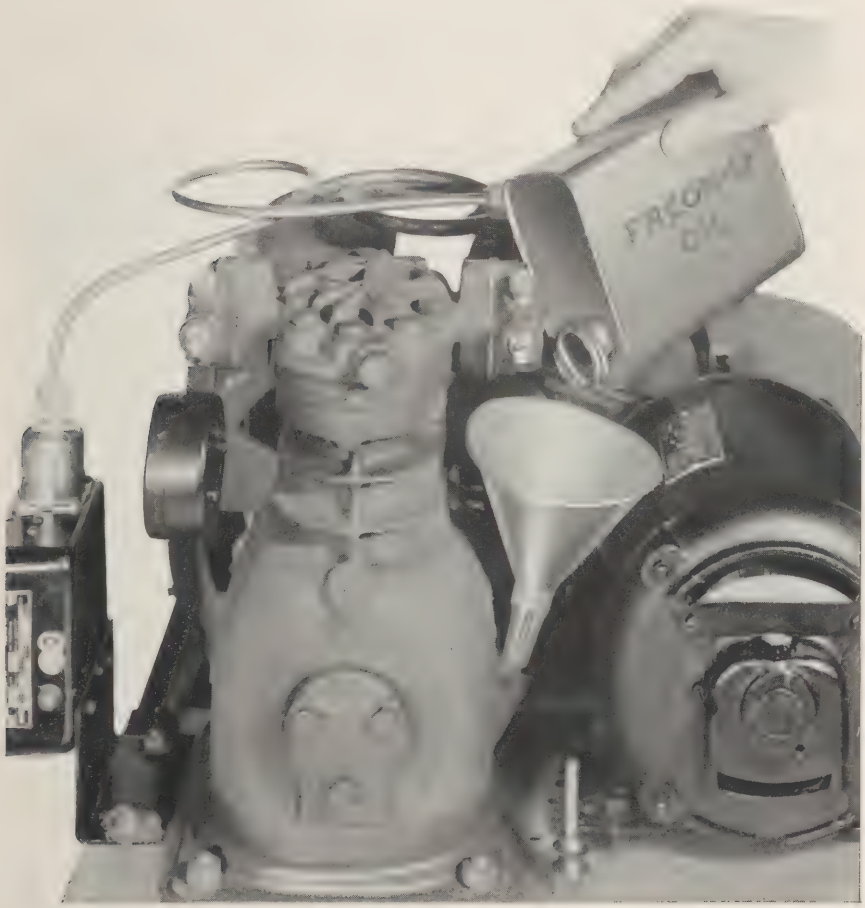


Figure 23. Adding oil to compressor.

(1) Balance the pressure for compressor repairs as outlined in par 42.

(2) Remove the compound gage and install the gage plug.

(3) Remove the oil plug and inspect oil level as indicated on the gage rod (fig 22). THE OIL MUST COME UP TO THE TOP MARK ON THE GAGE ROD. IF THE OIL LEVEL IS BELOW THIS MARK THE COMPRESSOR IS SHORT OF OIL.

(4) Insert a funnel in the oil plug opening and add the required amount of Freon 12 refrigerant oil to bring the level up to the top mark on the gage rod.

(5) Remove the funnel and reinstall the oil plug.

(6) Purge the compressor. (See par 43 a.)

(7) Back seat the suction and discharge service valves.

(8) Remove the pressure gage and install the gage plug and valve stem caps.

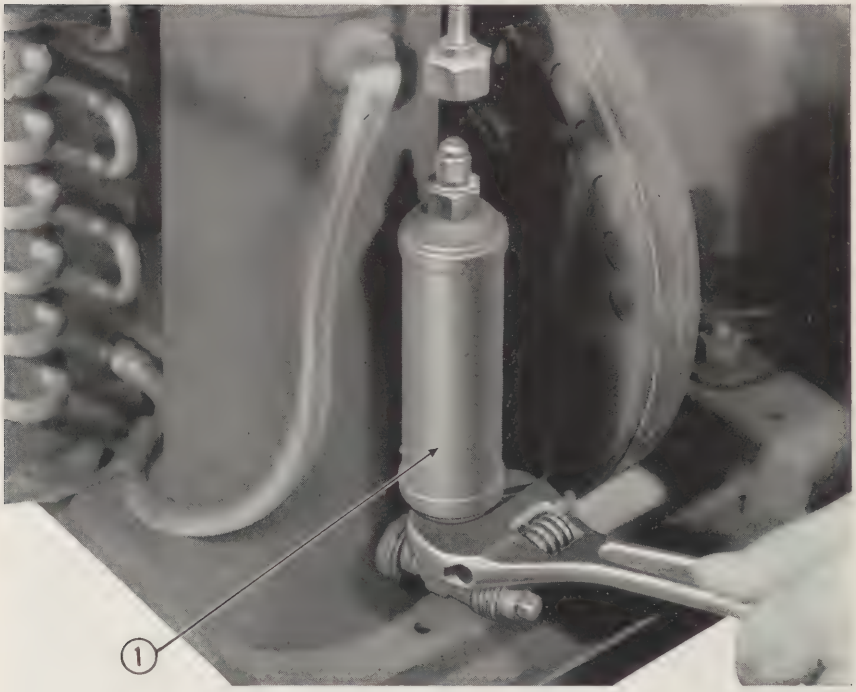


Figure 24. Removing the dehydrator.

Med. Dept. No.	Nomenclature
1. *9R27222*	*Dehydrator*

46. SERVICING THE DEHYDRATOR

a. Removing Moisture from the System. In order to properly correct a moisture condition it is necessary to have a dehydrator installed in the liquid line between the liquid receiver tank and the expansion valve. Therefore, a dehydrator is installed on this equipment when it leaves the factory to take care of any moisture that may enter the system due to opening operations such as installation of gages, etc. Even though this precaution is taken by the designer and manufacturer, the capacity of this dehydrator is limited.

(1) Should moisture freeze in the expansion valve restricting the flow of refrigerant, it may be necessary to apply heat to the expansion valve intermittently until the moisture that is causing the trouble has been carried throughout the system in its normal cycle, and returned to the dehydrator where it will be absorbed.

(2) Should the system be exposed to more moisture than the capacity of the dehydrator is capable of absorbing, it will be necessary to replace the dehydrator.

NOTE: UNDER EXTREME MOISTURE CONDITIONS IT MAY BE NECESSARY TO REPLACE THE DEHYDRATOR (FIG 24) MORE THAN ONCE TO THOROUGHLY FREE THE SYSTEM FROM MOISTURE.

b. Replacing the Dehydrator. To replace the dehydrator proceed as follows:

(1) Pump down the system. (See par 41.)

(2) Remove the liquid line from the top of the dehydrator by unscrewing the 1/4 inch flare nut.

(3) Remove the dehydrator from the liquid receiver valve by unscrewing the dehydrator with a wrench (fig 24).

(4) Screw on new dehydrator to the liquid receiver valve making certain that the copper washer is inserted in the female fitting of the dehydrator to form a gas tight connection.

(5) Reconnect the liquid line 1/4 inch flare nut to the male fitting on top of the dehydrator.

(6) Purge the low side of the refrigeration system. (See par 43 b.)

(7) Test for leaks. (See par 40.)

47. SERVICING THE EVAPORATOR

a. Removing the Evaporator. Direct service to the evaporator will be seldom, if ever, required unless the evaporator plates have been punctured by misuse or accident. Should this occur, the evaporator must be removed and, if possible, repaired; otherwise a new evaporator must be installed. The evaporator must also be removed from the cabinet to gain access for the removal of the heater element and controls. To remove the evaporator proceed as follows:

(1) Pump down the system. (See par 41.)

(2) Remove bottle racks and shelves from the evaporator.

(3) Remove the tube channel cover plate at rear of cabinet.

(4) Remove the sealing compound from the tube hole.

(5) Remove tape from the lines and cable in tube channel.

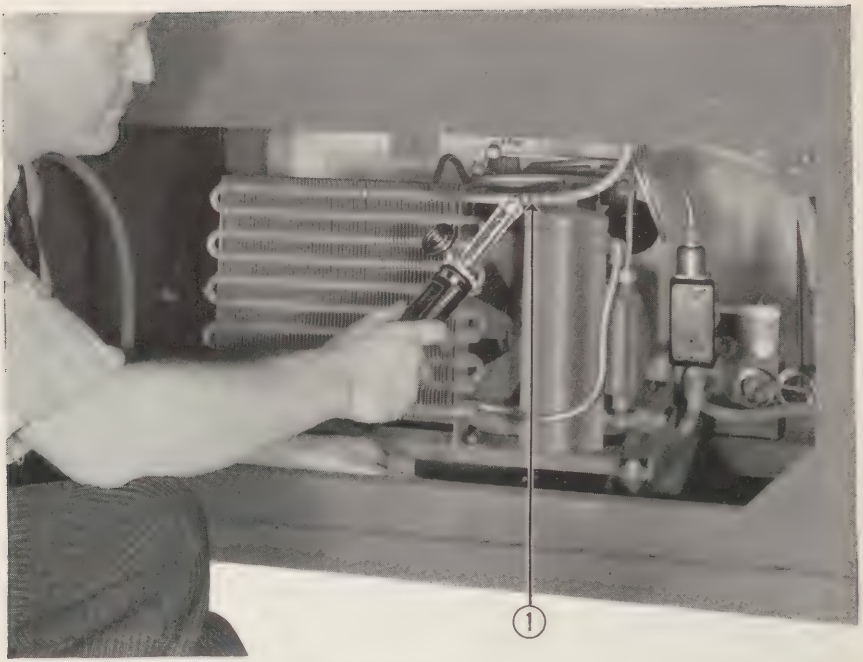


Figure 25. Unsoldering suction line union.

Med. Dept. No.	Nomenclature
1. 9R27240	*Coupling, line, suction*

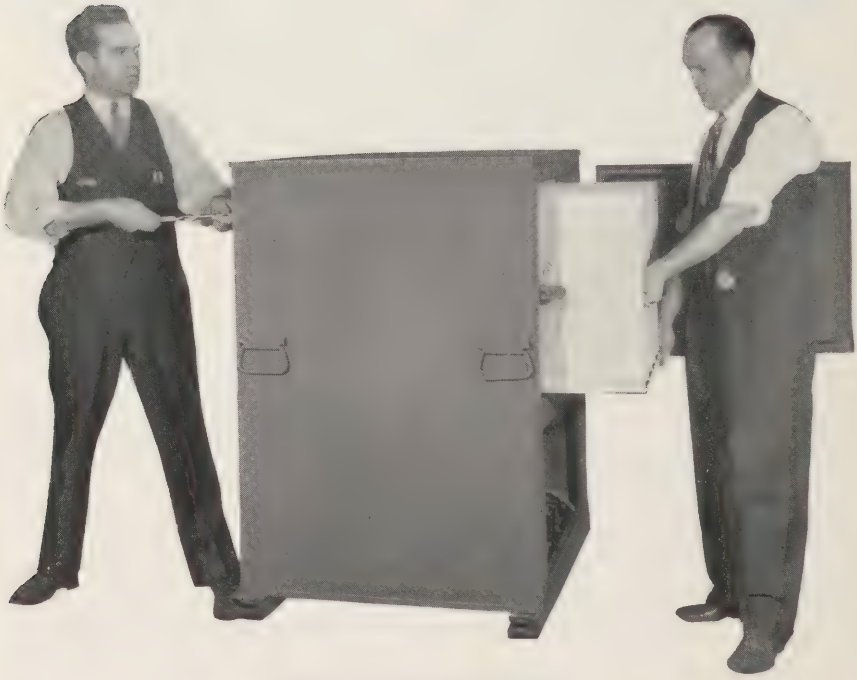


Figure 26. Removing evaporator.

(6) Disconnect the liquid line by unscrewing the ¼ inch flare nut on top of the dehydrator.

(7) Apply torch to the soldered fitting on the suction line union and disconnect union (fig 25, item 1).

(8) Remove the bends from the liquid and suction lines, and pull lines through lower tube channel opening.

(9) Plug the open ends of the lines with clean dry cloth to prevent moisture and foreign substances from entering.

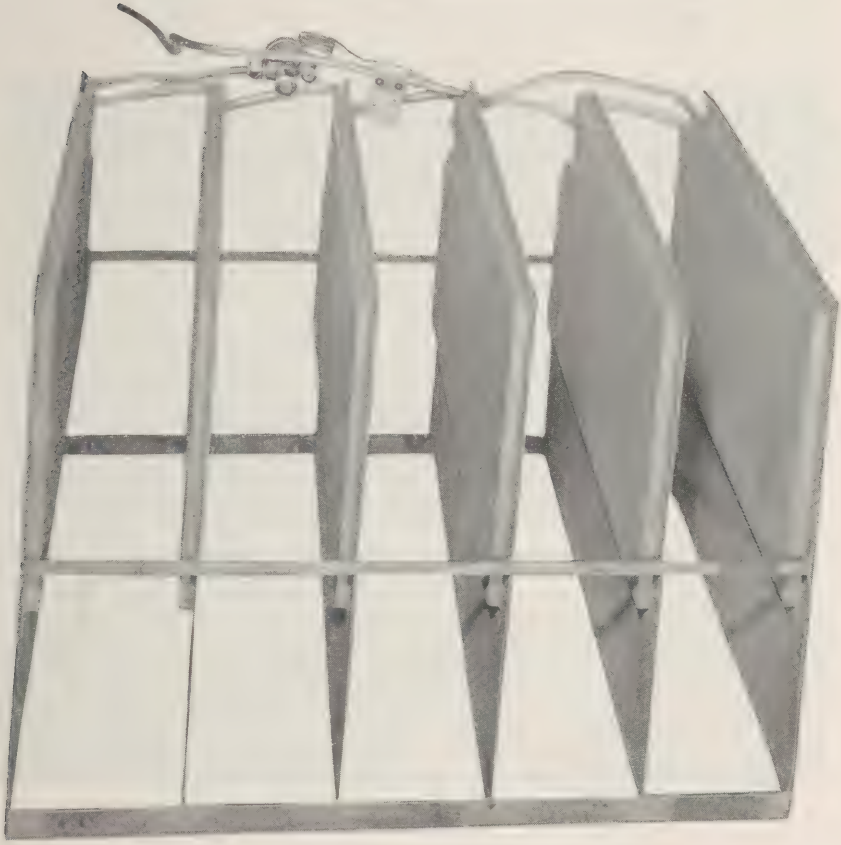


Figure 27. Evaporator removed.

(10) Remove the 8 supporting screws, SR01120 (fig 34, item 2), from the evaporator (4 in each end plate). Spacers, 9R27052 (fig 34, item 7), will drop as the screws are removed.

(11) Bend suction and liquid lines with a long sweep (so as not to kink) sufficient to permit the lines to pass through the tube hole in the cabinet.

(12) Slide the evaporator forward from the storage compartment, and at the same time guide the lines through the tube hole permitting the evaporator and lines to be removed as an assembly (fig 26).

b. Installing the Evaporator. To install the evaporator proceed as follows:

(1) Slide the evaporator with lines attached into the storage compartment guiding the lines through the tube hole in rear of cabinet.

(2) Replace the 8 supporting screws through the end plates and spacers by using a soft wire fitted around the spacers (fig 28). Withdraw the wire after the spacers are held in position by the supporting screws.

Figure 28. Installing evaporator support spacers.

(3) Shape the suction and liquid line tubing to the contour of the tube channel.

(4) Bend lines through lower tube channel opening. Remove plugs from the lines and resolder the suction line union and connect the liquid line to the dehydrator.

(5) Retape lines and cable in the tube channel.

(6) Soften the sealing compound in hot water and work into the tube hole, sealing the hole sufficiently to prevent heat leakage.

(7) Reinstall the tube channel cover plate with 10 screws.

(8) Open all 3 valves on condensing unit.

(9) Test for leaks. (See par 40.)

(10) Reinstall the shelves and bottle racks.

48. CONTROLS

a. Explanation of Control System. Since all controls have been accurately set at the factory be sure the control is at fault before attempting to adjust or correct its setting. DO NOT ADJUST OR CHANGE THE CONTROL SETTINGS UNTIL THE CONDENSING UNIT HAS COMPLETED AT LEAST 3 CYCLES. The operation of all controls may be observed by removing their inspection cover. On the low pressure control the cover is snapped into position at one point and hinged at the opposite side. On the refrigeration and heater thermostatic controls the covers are held in place by screws.

b. The refrigeration thermostatic control, 9R27190 (fig 29, item 4), and the low pressure control, 9R27202 (fig 29, item 3), are wired in series (fig 5). If the condensing unit does not operate when the storage compartment temperature has risen to a point where the controls are set to cut in, inspect both controls to see which one is holding open. Since the relative temperature pressure setting is lower than the temperature con-

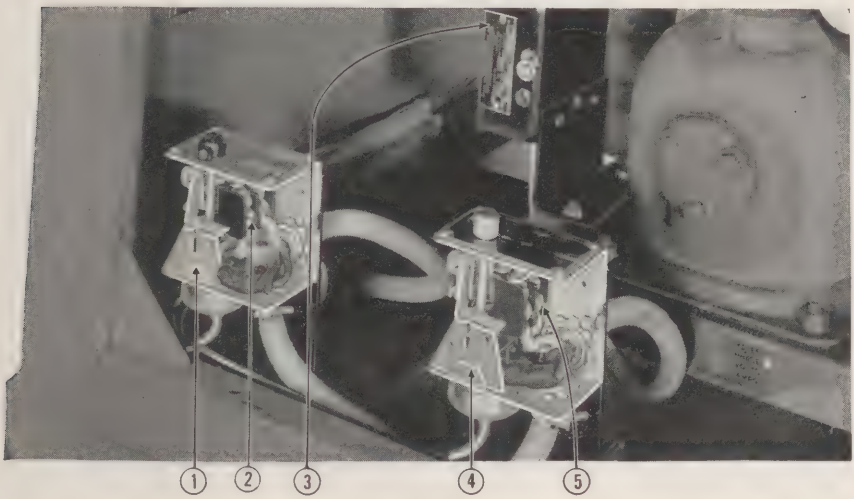


Figure 29. Controls.

	Med. Dept. No.	Nomenclature
1.	*9R27056*	*Control, thermostatic, heater*
2.		*Terminal screws*
3.	*9R27202*	*Control, pressure, low*
4.	*9R27190*	*Control, thermostatic, refrigeration*
5.		*Terminal screws*

trol setting, the low pressure control should not operate, but remain closed under normal conditions. The refrigeration thermostatic control actually controls the temperature within the storage compartment for refrigeration temperature condition, and is designed to operate the condensing unit motor. Contacts close on temperature rise and open on temperature drop.

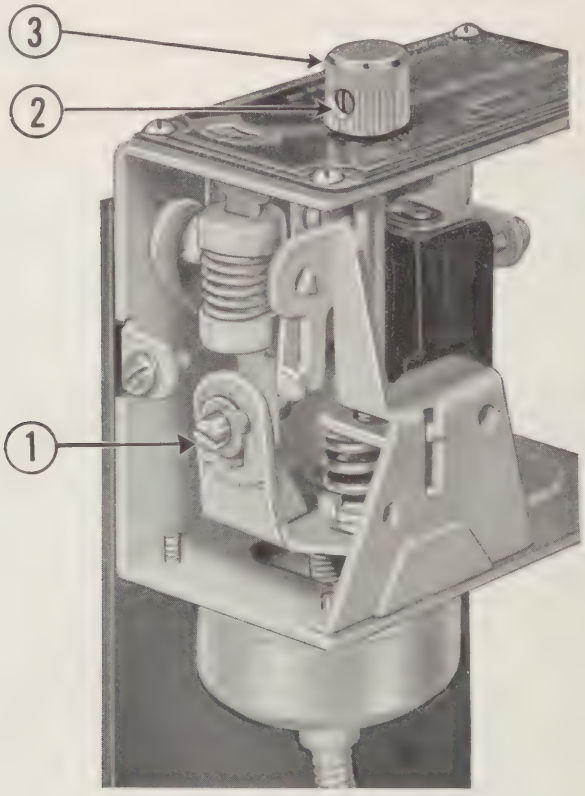


Figure 30. Refrigeration thermostatic control.

Nomenclature

1. *Differential adjustment*
2. *Set screw*
3. *Control knob*

This control is supplied with a cross, fin type bulb mounted in the storage compartment (fig 34, item 4) and based on air temperature differential of 1 degree Fahrenheit rise per minute. This should be taken into consideration when making any change in adjustment or noting reaction.

c. NO ATTEMPT SHOULD BE MADE TO SET OR ADJUST THE THERMOSTATIC CONTROLS TO AGREE WITH THE INDICATING DIAL THERMOMETER OF THE REFRIGERATOR. Each time the door is opened the bulb is swung into the outside

temperature. It is not practical to consider the condition indicated on the dial of the thermometer until the door has remained closed for a period of time sufficient to permit the equalization of the bulb to the temperature surrounding it. The temperature to which the thermostatic controls react are temperatures surrounding the cross fin bulbs mounted at the rear of the compartment. If an attempt is made to adjust the thermostatic controls in the field, it would be necessary to place an accurate thermometer at the same point of the fin bulbs. The object of the thermometer on the door only indicates that the condensing unit is actually performing as it should. THE THERMOMETER IS NOT TO BE USED AS A CRITICAL TEMPERATURE ADJUSTMENT FOR THE CONTROLS.

d. Altitude Adjustments. Changes in altitude affect the settings of the controls used in this refrigerator. Atmospheric pressure drops approximately 1 inch of mercury or ½ pound per square inch for each 1 thousand feet increase in altitude. Controls of the totally enclosed charged element type such as the refrigeration and heater thermostatic controls when calibrated in one certain altitude must be corrected if they are to be used at any other altitude. The settings must be raised if the controls are to be used at a higher altitude, and the settings must be lowered if the controls are to be used at a lower altitude. For example, these controls were set originally at an altitude of 600 feet. If the refrigerator cabinet is installed and used at a location where the altitude is 4,600 feet, the settings of the refrigeration and heater thermostatic controls must be raised approximately 1 degree for each 1,000 feet of altitude increase. In this case, the altitude increase was 4,000 feet; therefore, the control settings will have to be raised approximately 4 degrees in order to compensate for the altitude increase. The low pressure control setting must also be raised ½ pound for each 1,000 feet of altitude increase. Therefore, in the example cited above, the pressure setting must be raised 2 pounds to compensate for the 4,000 feet altitude increase.

e. Adjusting the Refrigeration Thermostatic Control. This control (fig 30) is equipped with a finger tip adjustment knob with limits to the user of 4 degrees Fahrenheit above and 4 degrees Fahrenheit below normal settings. The control knob (fig 30, item 3) is on the outside of the control. The adjustment knob is equipped with stops to maintain the limits of the setting. In making adjustments with the knob the temperature differential is constant.

(1) *RANGE ADJUSTMENT.* Should the limits of the refrigeration thermostatic control knob not permit the setting required, it will be necessary to release the set screw in the knob (fig 30, item 2) to obtain a greater range.

(2) *DIFFERENTIAL ADJUSTMENT.* Should the differential of the refrigeration thermostatic control require adjustment, remove the side cover and adjust by means of a screw driver at the point indicated (fig 30, item 1).

f. Removing the Refrigeration Thermostatic Control. If after proper diagnosis the control is faulty and must be replaced, remove the control as follows:

(1) Remove the evaporator from the cabinet. (See par 47 a.)

(2) Remove clamps from upper arched bulb at rear of the storage compartment (fig 34, item 5).

(3) Disconnect the extension cord plug from the source of supply.

(4) Remove cover from refrigeration thermostatic control (fig 29) by loosening the screws on both sides of the cover.

(5) Disconnect the wiring at terminal screws (fig 29, item 5), untape and unsolder splice. Remove cables.

(6) Remove the 2 screws from the supporting bracket of control.

(7) Remove the tube channel cover plate at rear of cabinet (fig 7). (Plate secured to cabinet by 10 screws.)

(8) Straighten finned bulb in storage compartment sufficient to allow passing through opening at rear of cabinet (fig 31).

Figure 31. Removing control bulb.

(9) Loosen clamps securing capillary lines and wiring in unit compartment and remove tape (fig 29).

(10) Pass finned bulb through opening at rear of storage compartment (fig 31). Release capillary line from tube channel and clamps. Lift clear the entire assembly through front of the unit compartment.

g. Installing the Refrigeration Thermostatic Control. To install the control proceed as follows:

(1) Place finned bulb through opening at bottom of tube channel and opening through cabinet at rear of storage compartment (fig 31).

(2) Shape capillary line and clamp bulb in an arched position above heater bulb on rear wall of storage compartment (fig 34, item 4).

(3) Shape capillary line in tube channel and unit compartment to the contour of the wiring cable under the clamps. Retape lines and cable (fig 7).

(4) Secure control by 2 screws through bracket to frame of cabinet.

(5) Install and connect cables to control in accordance with wiring diagram (fig 5). Solder and tape spliced connection.

(6) Attach cover of control and tighten screws on both sides.

(7) Reinstall evaporator. (See par 47 b.)

h. Adjusting the Heater Thermostatic Control. The heater thermostatic control, 9R27056 (fig 29, item 1), is very similar to the refrigeration thermostatic control except that the contacts open on temperature rise and close on temperature drop. The limits of the adjusting knob are the same as on the refrigeration thermostatic control, namely, 4 degrees Fahrenheit above and 4 degrees Fahrenheit below, or a total adjustment of 8 degrees Fahrenheit.

(1) *RANGE ADJUSTMENT.* Like the refrigeration thermostatic control, the range on the heater thermostatic control has been established within the limits of the adjusting knob.

(2) *DIFFERENTIAL ADJUSTMENT.* The differential in the heater thermostatic control is non-adjustable. It is set at a predetermined setting of 7 degrees Fahrenheit at the time of manufacture.

i. Removing the Heater Thermostatic Control. If after proper diagnosis the control is faulty and must be replaced, remove the control as follows:

(1) Remove evaporator from cabinet. (See par 47 a.)

(2) Remove clamps from lower straight bulb at rear of storage compartment (fig 34, item 3).

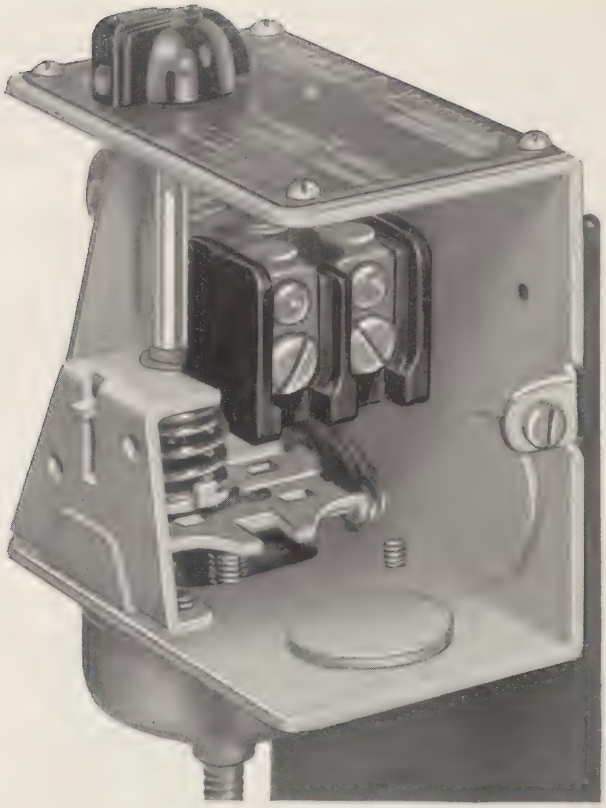


Figure 32. Heater thermostatic control.

(3) Disconnect extension cord plug from source of supply.

(4) Remove cover from heater thermostatic control by loosening screws on both sides of cover (fig 32).

(5) Disconnect the wiring at terminal screws, untape and unsolder splice. Remove cable.

(6) Remove the 2 screws from the supporting bracket of control.

(7) Remove the tube channel cover plate at rear of cabinet. (Plate secured to cabinet by 10 screws.) (fig 7).

(8) Straighten finned bulb in storage compartment sufficient to allow passing through opening at rear of cabinet (fig 31).

(9) Loosen clamps securing capillary lines and wiring in unit compartment and remove tape (fig 29).

(10) Pass finned bulb through opening at rear of storage compartment (fig 31). Release capillary line from tube channel and clamps. Lift clear the entire assembly through front of the unit compartment.

j. Installing the Heater Thermostatic Control. To install the control proceed as follows:

(1) Place finned bulb through opening at bottom of tube channel and opening through cabinet at rear of storage compartment (fig 31).

(2) Shape capillary line and clamp bulb below the refrigeration thermostatic bulb on rear wall of storage compartment (fig 34, item 3).

(3) Shape capillary line in tube channel and unit compartment to the contour of the wiring cable under the clamps. Retape lines and cable (fig 7).

(4) Secure control by 2 screws through bracket to frame of cabinet.

(5) Install and connect cables to control in accordance with wiring diagram (fig 5). Solder and tape spliced connection.

(6) Attach cover of control and tighten screws on both sides.

(7) Reinstall evaporator. (See par 47 b.)

k. Adjusting the Low Pressure Control. The low pressure control, 9R27202 (fig 29, item 3), is designed to automatically control the condensing unit motor in series with the refrigeration thermostatic control. Contacts close on pressure rise and open on pressure drop.

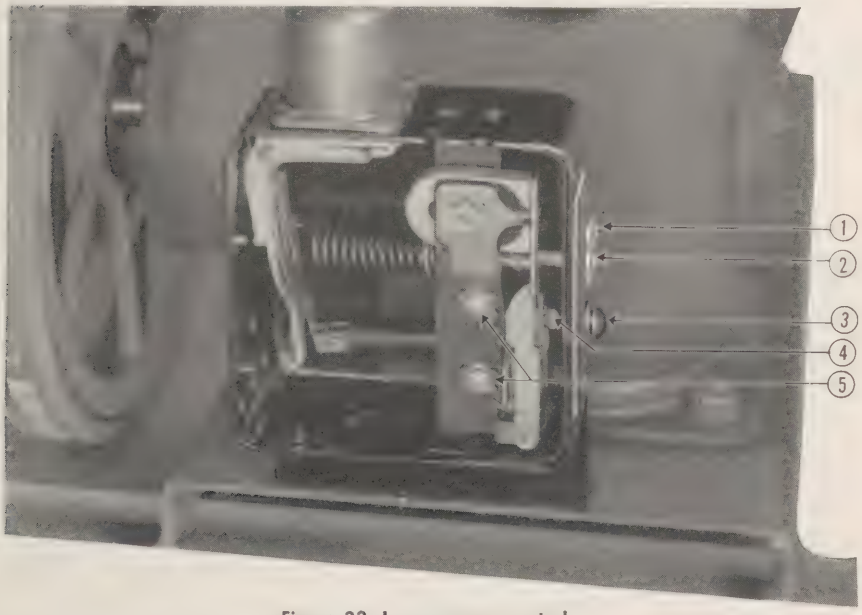


Figure 33. Low pressure control.

Nomenclature

1. *Adjusting screw lock*
2. *Adjusting screw*
3. *Rubber sealing plug*
4. *Differential adjusting screw*
5. *Cable lead terminals*

The purpose of this control is to prevent the temperature dropping below the freezing point of whole blood should the refrigeration thermostatic control fail to open. The normal setting of this control is to cut in at 27 pounds pressure, and cut out at 15 pounds pressure. Before making any change in the setting of this control take into consideration that changing the adjustment may cause the condensing unit to operate from the low pressure control instead of the temperature control which is not the intention of the designer as the low pressure control is intended only as an emergency cut-out.

(1) *CUT-IN AND CUT-OUT ADJUSTMENT.* To change both the cut-in and cut-out point of the low pressure control, install the gages. (See par 38.) Remove the adjusting screw lock (fig 33, item 1) which is attached to the adjusting screw (item 2). To raise the temperature setting, turn the spring adjusting screw to the right (clockwise). To lower the temperature setting, turn the adjusting screw in a counter clockwise direction or to the left. In making this adjustment you will be lowering or raising both the cut-in point and the cut-out point as the case may be. In setting the control the cut-in point must be established first. After the adjustment has been made replace the lock and screw to prevent adjusting screw from vibrating from its new position.

(2) *DIFFERENTIAL ADJUSTMENT.* To change the cut-in point only, or to change the differential setting remove the rubber sealing plug (fig 33, item 3). Insert small screw driver through the hole from which the rubber plug was removed and engage the screw driver in the slotted differential adjusting screw (fig 33, item 4).

To lower the cut-in point only, turn the adjusting screw to the right or clockwise. To raise the cut-in point or widen the differential, turn the adjusting screw to the left or counter clockwise. After the adjustment has been made, reinsert the sealing plug in the adjustment hole.

WARNING: THE EXTENSION CORD PLUG MUST BE DISCONNECTED FROM THE SOURCE OF SUPPLY BEFORE ATTEMPTING TO MAKE ANY ADJUSTMENTS ON THE LOW PRESSURE CONTROL. THIS APPLIES PARTICULARLY TO THE DIFFERENTIAL ADJUSTMENT SINCE THE CONTACTS ARE ELECTRICALLY COMMON TO THE ADJUSTING SCREWS ON WHICH YOU ARE PLACING YOUR SCREW DRIVER.

l. Removing the Low Pressure Control. If after proper diagnosis the control is faulty and must be replaced, remove the control as follows: (fig 33).

(1) Pump down the system. (See par 41.)

(2) Disconnect the extension cord plug from the source of supply.

(3) Disconnect the 1/4 inch flare nut connection on top of the control.

(4) Remove the 2 screws supporting the control bracket with cable attached and lift control to the front of the cabinet.

(5) Remove the cover plate from the control.

(6) Disconnect the cable leads at the control terminals (fig 33, item 5).

(7) Remove the cable from the control.

(8) The control is now free and can be removed from the unit compartment.

m. Installing the Low Pressure Control. To install the low pressure control proceed as follows: (fig 33).

(1) Install cable into control box and connect the cable leads to the control terminals (fig 33, item 5).

(2) Attach cover plate to the control.

(3) Place control into position and secure to the unit base by 2 screws through the mounting bracket.

(4) Loosely connect the 1/4 inch flare nut connection on the top of the control (DO NOT TIGHTEN NUT GAS TIGHT).

(5) Purge the 1/4 inch control line by slightly opening and immediately closing the liquid receiver valve. This action will allow a small amount of refrigerant gas to pass through the 1/4 inch control line and force any trapped air out through the loosely connected 1/4 inch flare nut.

(6) Tighten the 1/4 inch flare nut connection on top of the control gas tight.

(7) Open the liquid receiver valve to a firm left seat and test for leaks. (See par 40.)

(8) Open the suction service valve and the discharge service valve to a back seating position.

(9) Reinstall the 3 valve stem caps.

(10) Remove the gages and reinstall the gage plugs.

(11) Reconnect the extension cord plug to the source of supply.

49. SERVICING THE HEATER UNIT

a. Removing the Heater. If after a diagnosis the heater unit is found to be at fault, inspect the cable leads making sure they are securely fastened to the heater terminal posts. Should the terminals be securely fastened and the heater unit still fails to operate, the heater must be replaced. To replace the heater unit proceed as follows:

(1) Remove the evaporator. (See par 47 a.)

(2) Disconnect the extension cord plug from the source of supply.

(3) Remove the 2 screws, SR00892 (fig 34, item 1), supporting the heater unit assembly at the rear of the cabinet.

(4) Remove 3 screws, SR00141 (fig 35, item 10), from the clamps, 9R27246 (fig 35, item 8), supporting the heater element.

(5) Disconnect the cable leads from the terminals (fig 35, item 6).

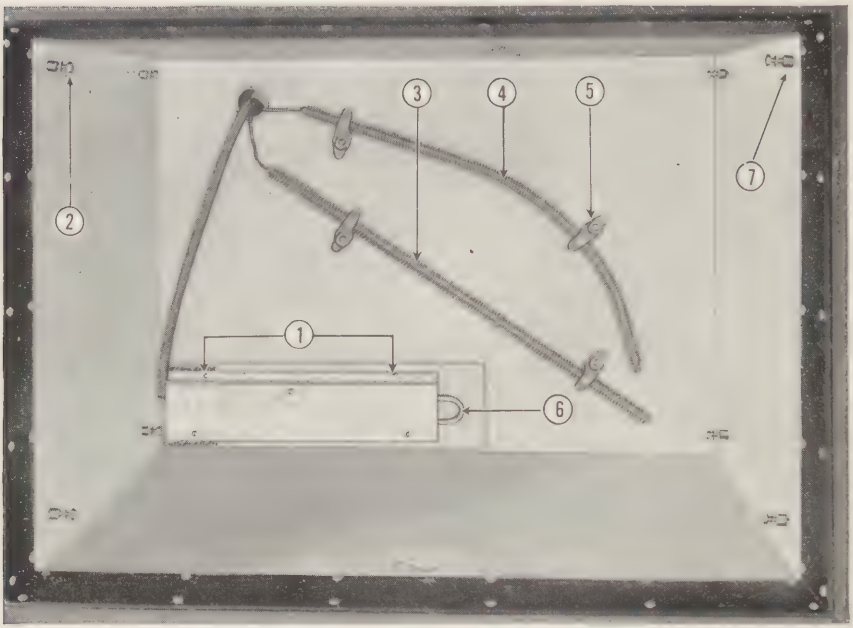


Figure 34. Heater unit and control bulbs installed.

	Med. Dept. No.	Nomenclature
1.	*SR00892*	*Screw, 10 x 3/8 inch sheet metal R.H. "Z"*
2.	*SR01120*	*Screw, 1/4-20 x 1 inch hex. hd. cap*
3.		*Heater thermostatic control bulb*
4.		*Refrigeration thermostatic control bulb*
5.	*9R27058*	*Clamp, thermostatic, controls*
6.	*9R27054*	*Element, heating*
7.	*9R27052*	*Spacer, support, evaporator*

b. Installing the Heater. To install the heater unit proceed as follows:

(1) Connect the cable leads to the terminals of the heating unit (fig 35, item 6).

(2) Place small mica insulator between guard and terminals and aline holes (fig 35, item 5).

(3) Fasten heater element to guard, 9R27244 (fig 35, item 9), by means of 3 clamps, screws and nuts as shown in fig 35.

(4) Place into position at the rear of the cabinet alining all holes to conform with the holes in the rear of the compartment so as to permit the assembly of the asbestos pad (item 2) mica insulator (item 4) and guard (item 9) in sequence as shown in fig 35.

(5) Secure the assembly by 2 screws (fig 34, item 1) through the guard and components to the rear wall of the cabinet.

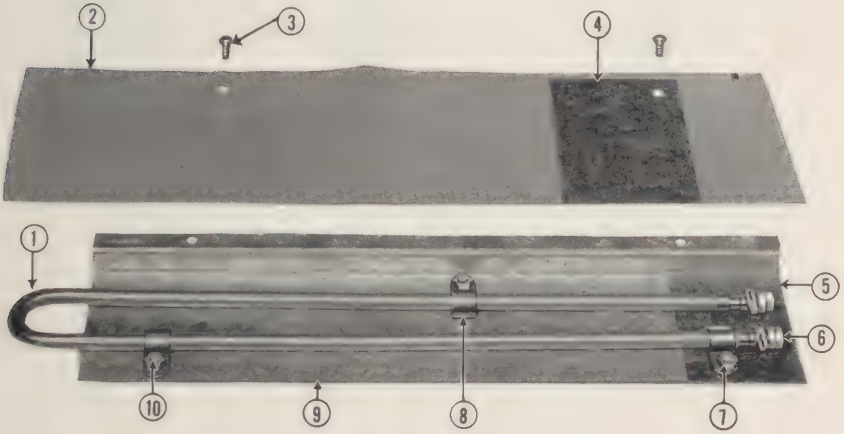


Figure 35. Heater unit assembly.

	Med. Dept. No.	Nomenclature
1.	9R27054	*Element, heating*
2.	9R27242	*Pad, unit, heating*
3.	SR00892	*Screw, 10 x 3/8 inch sheet metal R.H. "Z"*
4.	9R27260	*Insulator, heating unit and pad*
5.	9R27258	*Insulator, heating unit and guard*
6.		*Terminal nuts*
7.	SR00330	*Nut, #10-32 hex. mach. scr.*
8.	9R27246	*Clamp, unit, heating*
9.	9R27244	*Guard, unit, heating*
10.	SR00141	*Screw, #10-32 x 5/16 R.H. mach.*

50. SERVICING THE THERMOSTATIC EXPANSION VALVE

a. The thermostatic expansion valve is the control or metering device that reduces the pressure of the refrigerant permitting it to expand as it enters the evaporator. In order to perform its function the orifice in the expansion valve is very small. The most common service problem of the valve is the restricting of the orifice by either foreign material carried with the refrigerant or the freezing of moisture.

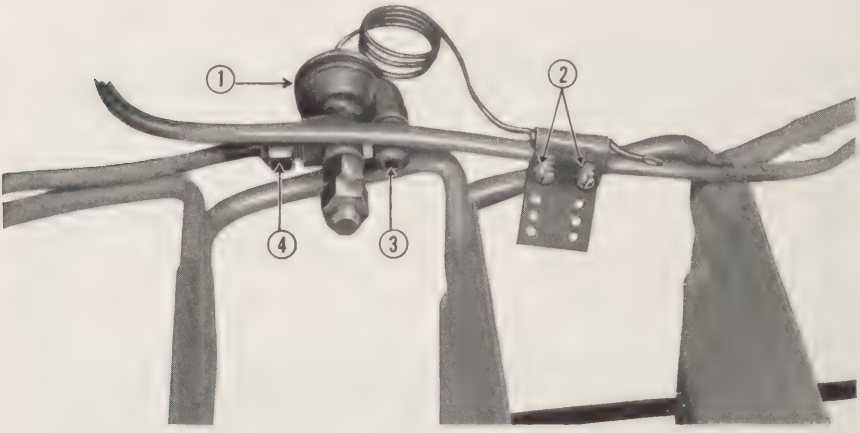


Figure 36. Thermostatic expansion valve installed.

	Med. Dept. No.	Nomenclature
1.	*9R27188*	*Valve, expansion, thermostatic*
2.		*Thermostatic bulb clamp screws*
3.	*9R27220*	*Nut, flare, 1/4 inch*
4.	*9R27224*	*Nut, flare, 3/8 inch*

b. To minimize these service problems the refrigerator is equipped with a dehydrator which under normal conditions will prevent moisture from restricting the valve as well as filtering out foreign substances from the refrigerant.

c. The most common indication of either moisture or dirt restricting the valve will be short cycling of the unit or failure to operate due to the pressure dropping below the cut-out point of the low pressure control. Since the symptoms of both moisture and dirt are similar, it will be necessary to melt the ice in the expansion valve. To melt the ice, apply a warm cloth to the body of the valve. (Do not apply torch to the expansion valve.) If the restriction is caused by moisture, the restriction will clear after an application of heat on the valve and will be indicated by the back pressure reading on the compound gage.

d. Should the valve fail to become operative after heat has been applied, the indication would then point to a stuck-closed condition or

restriction due to dirt or foreign substances. Should either of these two conditions prevail, the remedy is to remove the expansion valve, and clean or replace it.

e. *Adjusting the Expansion Valve.* The expansion valve is automatic and under normal conditions no adjustments are required. A superheat adjustment is provided and the adjustment has been properly set at the factory and no attempt should be made to readjust unless it has been subjected to tampering or abuse. To adjust the superheat proceed as follows:

(1) Remove the bottle racks and shelves from the evaporator.

(2) Remove the valve stem (fig 37, item 5) exposing the adjusting stem (fig 37, item 2).

(3) To raise the superheat turn the adjusting stem counter clockwise.

(4) To lower the superheat turn the adjusting stem clockwise.

(5) Reinstall the valve stem cap gas tight.

f. *Removing the Expansion Valve.* To remove the expansion valve proceed as follows:

(1) Remove the bottle racks and shelves from the evaporator.

(2) Install the gages. (See par 38.)

(3) Pump down the system. (See par 41.)

(4) Loosen the 2 screws on the thermostatic bulb clamp (fig 36, item 2) and remove bulb from clamp.

(5) With a clean cloth wipe dry all fittings on the expansion valve.

(6) Unscrew the suction and liquid line flare nuts (fig 36, items 3 and 4) and remove from the valve.

(7) The expansion valve is now free from the cabinet.

g. *Cleaning the Expansion Valve Strainer.* To clean the expansion valve strainer proceed as follows:

(1) Remove the expansion valve as outlined in par 50 f.

(2) Unscrew the liquid line fitting (fig 37, item 6) from the valve.

(3) Remove the strainer from the liquid line fitting (fig 37, item 7).

(4) Clean the strainer using carbon tetrachloride.

(5) Replace the strainer into the liquid line fitting and connect fitting to valve.

(6) Install the expansion valve as outlined in par 50 h.

h. *Installing the Expansion Valve.* Have the replacement valve available for immediate installation and exercise care in not leaving the system open to the atmosphere longer than necessary. To install the expansion valve proceed as follows:

(1) Reconnect the suction and liquid line flare nuts (fig 36, items 3 and 4) to the expansion valve. Connections must be gas tight.

(2) Secure the thermostatic bulb under the clamp at former location on the suction line between the center evaporator plates (fig 36) and tighten screws on clamp.

(3) Purge the low side of the refrigeration system. (See par 43 b.)

(4) Inspect to see that the suction service valve, discharge service valve and liquid receiver valve are back seated.

(5) Test for leaks (See par 40.)

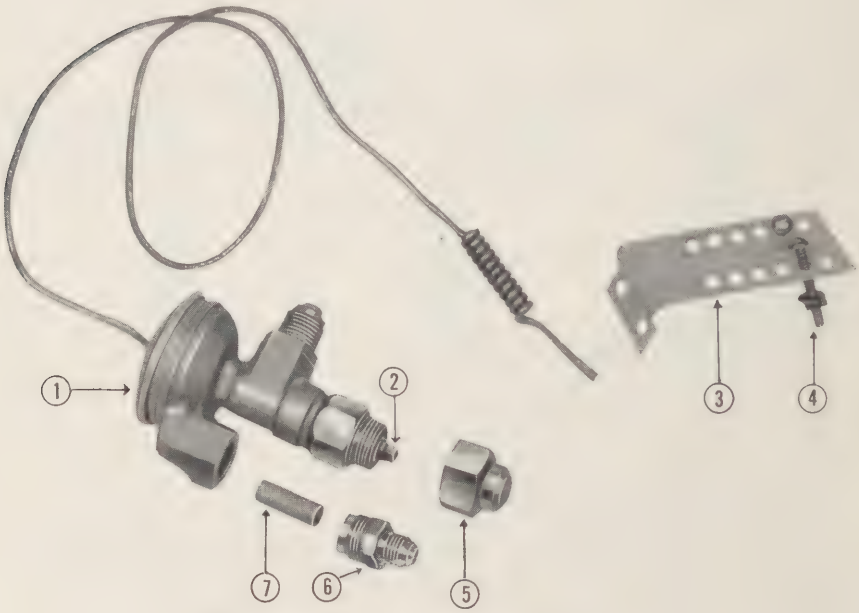


Figure 37. Thermostatic expansion valve removed.

Med. Dept. No.	Nomenclature
1. 9R27188	*Valve, expansion, thermostatic*
2.	*Super heat adjusting stem*
3.	*Thermostatic bulb clamp*
4.	*Thermostatic bulb clamp screws*
5.	*Valve stem cap*
6.	*Liquid line fitting*
7.	*Strainer*

51. SERVICING THE CYLINDER HEAD SUCTION STRAINER

a. Removing the Cylinder Head Suction Strainer. A strainer is installed in the suction port of the compressor head (fig 38, item 1) to prevent dirt or foreign substances from entering the compressor. To remove the strainer proceed as follows:

(1) Balance the pressure for compressor repairs. See par 42.

(2) Disconnect the suction service valve from the compressor by removing the 2 screws, SR01142 (fig 39, item 4). Restrictor, 9R27130 (item 2), will drop when suction service valve is removed.

(3) Remove the strainer from the suction port of the compressor head.

(4) Clean strainer with carbon tetrachloride or replace.

b. Installing the Cylinder Head Suction Strainer. To install the strainer proceed as follows:

(1) Insert the strainer in suction port of compressor (fig 38, item 1).

(2) Assemble and attach with 2 screws, SR01142, the suction service valve, restrictor, 9R27130, and 2 new service valve gaskets, 9R27142 (fig 39).
CAUTION: RESTRICTOR MUST BE INSTALLED BETWEEN THE 2 GASKETS (fig 39).

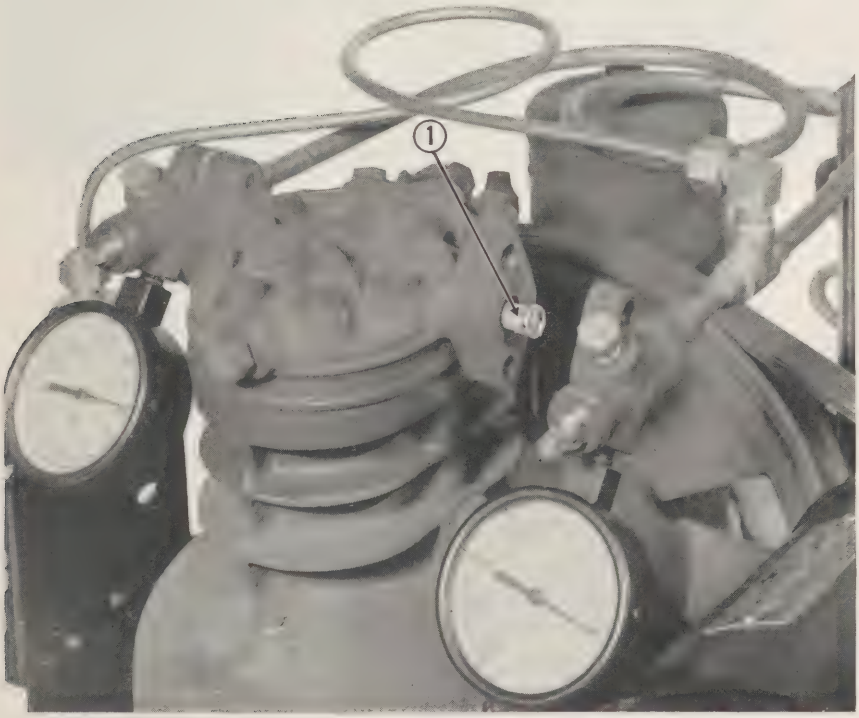


Figure 38. Cylinder head suction strainer.

Med. Dept. No.	Nomenclature
1. 9R27126	*Strainer, suction head, cylinder*

(3) Purge the compressor. (See par 43 a.)
(4) Back seat the suction and discharge service valves.
(5) Remove gages and install gage plugs.
(6) Install valve stem caps.
(7) Test for leaks. (See par 40.)

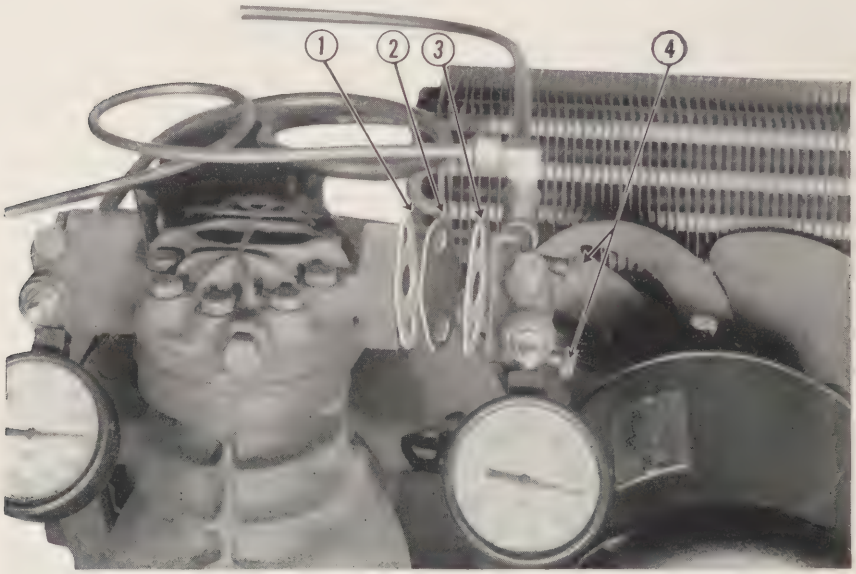


Figure 39. Suction service valve restrictor.

	Med. Dept. No.	Nomenclature
1.	9R27142	*Gasket, service, valve*
2.	9R27130	*Restrictor, valve, service, suction*
3.	9R27142	*Gasket, service, valve*
4.	SR01142	*Screw, 5/16-18 x 1 1/8 inch hex. hd. cap*

52. SERVICING THE CYLINDER HEAD VALVE PLATE ASSEMBLY

a. Testing the Cylinder Head Valve Plate Discharge Reeds. If the reeds on the cylinder head valve plate assembly leak very seriously, a reduction in the efficiency of the unit will result. The leakage will cause an increase in the running time as well as poor and inefficient refrigeration. To determine whether the reeds are leaking the following tests can be made:

(1) Install the gages. (See par 38.)
(2) Disconnect the extension cord plug from the source of supply, and permit the pressure in the low side (as noted on compound gage) to build up to at least 25 pounds pressure.
(3) Test for leaks. (See par 40.) If any leaks are detected they must

be corrected before proceeding with the test.

(4) Front seat the suction service valve, connect the extension cord plug to the source of supply, and operate compressor intermittently until the compound gage indicates 0 pounds pressure. (TO OBTAIN THIS READING IT WILL BE NECESSARY TO MANUALLY CLOSE THE LOW PRESSURE CONTROL CONTACT POINTS BY REMOVING CONTROL COVER PLATE AND MANUALLY DEPRESSING THE LEVER AS INDICATED IN FIG 19.)

(5) With the compressor idle (not operating), should the pressure indicated on the compound gage remain constant, the discharge reeds are seating properly. If the gage pressure rises more than 5 pounds in 1 minute, the discharge reeds are leaking and should be removed for replacement or repair.

b. Testing the Cylinder Head Valve Plate Suction Reeds. To determine whether the reeds are leaking the following tests can be made:

(1) With the suction service valve still in a front seated position, operate the compressor until the oil pumping stops (oil pumping is indicated by sharp knocking in the compressor) and then allow compressor to operate continuously. TO DO THIS IT WILL BE NECESSARY TO BLOCK THE LOW PRESSURE CONTROL CONTACT POINTS BY REMOVING THE CONTROL COVER PLATE AND WEDGING A PIECE OF WOOD BETWEEN THE INNER CASE OF THE CONTROL AND THE CONTACT ARM AS INDICATED IN FIG 18.

(2) Compressor should be able to pump a vacuum of at least 20 inches against normal head pressure. Failure to do this indicates that the gas is leaking back through the suction reeds.

(3) To correct the leak, the reeds or the cylinder head valve plate assembly must be replaced.

(4) Back seat the discharge and suction service valves, remove the gages, and reinstall the gage plugs and valve stem caps.

(5) Remove the wooden wedge from the low pressure control and reinstall the control cover.

c. Repairing the Cylinder Head Valve Plate Assembly. To repair the valve plate assembly proceed as follows:

(1) Balance the pressure for compressor repairs. (See par 42.)

(2) Remove the 10 compressor head screws, SR01139 (fig 53, item 1).

(3) Remove the cylinder head valve plate assembly between the compressor head and cylinder block.

(4) Determine the extent of replacement parts required and replace what is necessary on the cylinder head valve plate providing the valve plate seats have not been scratched or injured, and are in condition to justify repairs.

(5) Reinstall cylinder head valve plate assembly using 2 new gaskets, 9R27132 and 9R27134.

(6) Reinstall the 10 compressor head screws setting up gas tight by pulling down evenly, working from side to side.

(7) Purge the compressor. (See par 43 a.)

(8) Back seat the suction and discharge service valves, remove the gages, and reinstall the gage plugs and valve stem caps.

(9) Test for leaks. (See par 40.)

d. Replacing the Cylinder Head Valve Plate Assembly. If inspection of the valve plate seats indicate that they are scratched or injured in any way, replacing the reeds must not be attempted, but instead the entire valve plate assembly must be replaced. To replace the valve plate assembly proceed as follows:

(1) Balance the pressure for compressor repairs. (See par 42.)

(2) Remove the 10 compressor head screws, SR01139 (fig 53, item 1).

(3) Remove the valve plate assembly between the compressor head and cylinder block.

(4) Reinstall valve plate assembly using 2 new gaskets, 9R27132 and 9R27134.

(5) Reinstall the 10 compressor head screws setting up gas tight by pulling down evenly, working from side to side.

(6) Purge the compressor. (See par 43 a.)

(7) Back seat the suction and discharge service valves, remove the gages, and reinstall the gage plugs and valve stem caps.

(8) Test for leaks. (See par 40.)

53. SERVICING THE COMPRESSOR SERVICE VALVES

a. Removing the Suction Service Valve. Service difficulties should not be encountered in the operation of the compressor service valves. The valve seats are enclosed and their operation is manual (fig 13). The valve stem packing nuts must be kept tight at all times to prevent refrigerant leaks. To remove the suction service valve proceed as follows:

(1) Pump down the system. (See par 41.)

(2) Disconnect the extension cord plug from the source of supply.

(3) Disconnect the suction service valve from the compressor head by removing the 2 screws, SR01142 (fig 39, item 4). Restrictor, 9R27130 (item 2), will drop when valve is removed.

(4) Remove the 1/4 inch flare nut from the elbow fitting (fig 40, item 1), on suction line where tubing is connected to the low pressure control.

(5) Swing suction line and suction service valve toward the rear of the cabinet in a long, easy sweep to prevent kinking the line.

(6) Hold valve with pliers and apply torch to the sweat fitting to remove the valve (fig 41).

b. Installing the Suction Service Valve. To install the suction service valve proceed as follows:

(1) Sweat new valve on suction line and permit to cool.

(2) Swing suction line and valve into proper position.

(3) Connect the valve to the compressor head with 2 screws, SR01142, using 2 new gaskets, 9R27142. Make certain that the restrictor, 9R27130 (fig 39, item 2), is assembled between the 2 gaskets.

(4) Reconnect the 1/4 inch flare nut to the elbow fitting on the

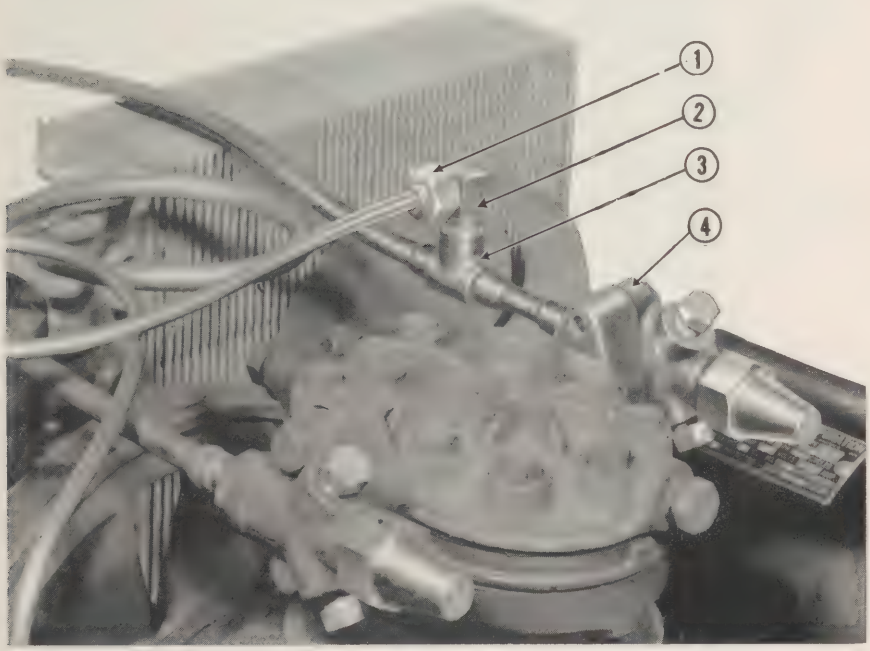


Figure 40. Low pressure control connections.

Med. Dept. No.	Nomenclature
1. *9R27220*	*Nut, flare, 1/4 inch*
2. *9R27226*	*Ell, control, pressure, low*
3. *9R27236*	*Tee, line, suction*
4. *9R27062*	*Valve, service, suction*

suction line where the tubing is connected to the low pressure control.

(5) Purge the low side of the refrigeration system. (See par 43 b.)

(6) Test for leaks. (See par 40.)

c. *Removing the Discharge Service Valve.* To remove the discharge service valve proceed as follows:

(1) Remove the refrigerant from the system. (See par 44 b.)

(2) Disconnect the discharge service valve from the compressor head by removing the 2 screws, SR01142.

(3) Hold valve with pliers and apply torch to the sweat fitting until the solder is melted (fig 42). Pull the valve free from the line.

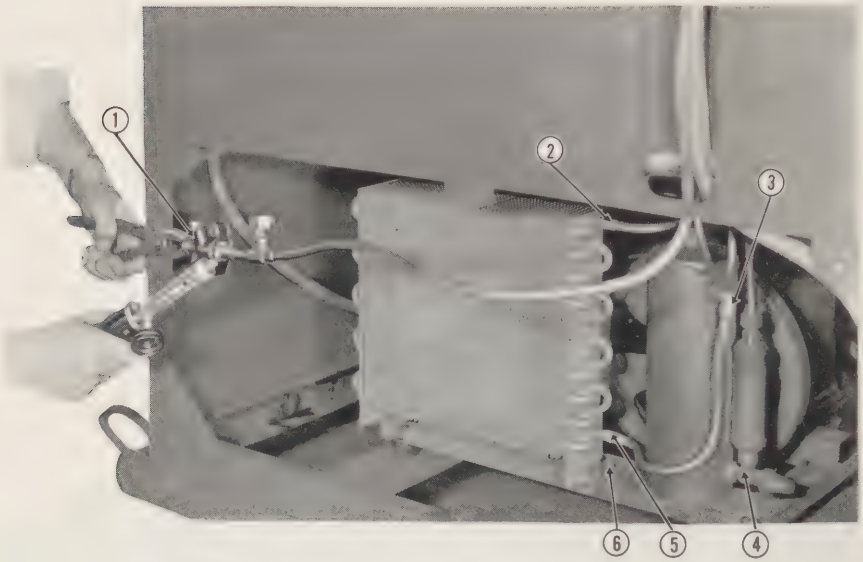


Figure 41. Unsoldering suction service valve.

	Med. Dept. No.	Nomenclature
1.	*9R27062*	*Valve, service, suction*
2.		*Condenser soldered connection*
3.		*Dehydrator soldered connection*
4.	*9R27210*	*Valve, receiver, liquid*
5.		*Condenser outlet soldered connection*
6.	*SR01140*	*Screw, 1/4-20 x 1/2 inch hex. hd. cap*

d. *Installing the Discharge Service Valve.* To install the discharge service valve proceed as follows:

(1) Sweat the new valve on the discharge line and permit to cool.

(2) Connect the valve to the compressor head with the 2 screws, SR01142, using a new gasket, 9R27142.

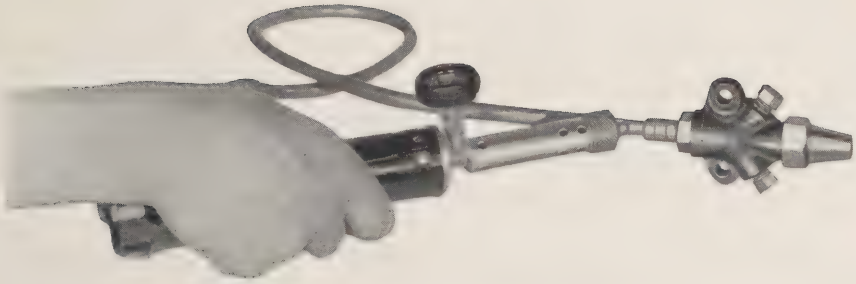


Figure 42. Unsoldering discharge service valve.

(3) Purge the entire refrigeration system. (See par 43 c.)
(4) Add Freon 12 refrigerant to the system. (See par 44 a.)
(5) Test for leaks. (See par 40.)
(6) Back seat the suction and discharge service valves, remove gages and install plugs.
(7) Reinstall the 3 valve stem caps.

54. SERVICING THE LIQUID RECEIVER

a. Removing the Liquid Receiver. To service the liquid receiver or its component parts, the refrigerant must be pumped back into the receiver and then removed from the system. To remove the receiver proceed as follows:

(1) Remove the refrigerant from the system. (See par 44 b.)
(2) Remove the liquid line from the dehydrator by unscrewing the 1/4 inch flare nut.
(3) Unscrew the dehydrator from the liquid receiver valve (fig 24, item 1).
(4) Remove condenser inlet tube at top of receiver by applying torch and unsweating the soldered connection (fig 41, item 3).
(5) From the under side of the unit base, remove the nut from the stud extending from the base of the receiver through the base of the condensing unit.
(6) Lift the receiver clear from the unit compartment.

b. Installing the Liquid Receiver. To install the receiver proceed as follows:

(1) Place receiver in position on the condensing unit base and secure with nut to the stud extending from the base of the receiver through the base of the condensing unit.
(2) Connect the condenser inlet tube to the top of the receiver by applying torch and sweating the soldered connection (fig 41, item 3).

(3) Screw the dehydrator on to the liquid receiver valve.

(4) Connect the liquid line by screwing the 1/4 inch flare nut to the top of the dehydrator.

(5) Purge the entire refrigeration system. (See par 43 c.)

(6) Add refrigerant to the system. (See par 44 a.)

(7) Test for leaks. (See par 40.)

c. Removing the Liquid Receiver Valve. Service difficulties should not be encountered in the operation of the liquid receiver valve. The valve and seat are enclosed and the operation is manual. The valve stem packing nut must be kept tight at all times to prevent refrigerant leaks (fig 14). To remove the liquid receiver valve proceed as follows:

(1) Remove the liquid receiver as outlined in par 54 a.

(2) With a wrench unscrew the liquid receiver valve from the receiver (fig 41, item 4).

d. Installing the Liquid Receiver Valve. To install the liquid receiver valve proceed as follows:

(1) Before installing a new valve in the receiver, apply a thin coating of lead, white, basic-carbonate, type C, on the threads of the valve.

(2) Screw valve into the receiver and tighten with a wrench. CAUTION: WHEN TIGHTENING THE VALVE CARE MUST BE EXERCISED TO PREVENT DAMAGE TO THE 1/4 INCH FLARE CONNECTING THREADS.

(3) The 1/4 inch flare connector must be turned to an upright position to permit attachment of the dehydrator.

(4) Install the receiver. (See par 54 b.)

e. Removing the Receiver Fuseable Plug. The fuseable plug is a pipe plug consisting of a core filled with a low-melting point alloy (fig 9, item 6). In the event of an excessive temperature, the alloy in the core melts allowing the refrigerant to be released to the atmosphere thereby preventing excessive pressures from rupturing the condenser, liquid receiver and other component parts of the unit. To remove the fuseable plug from the liquid receiver proceed as follows:

(1) In the event there is still some refrigerant remaining in the system it must be removed as outlined in par 44 b.

(2) Unscrew the fuseable plug with a 10 inch adjustable wrench. Exercise care to prevent pipe thread compound or dirt from falling into the receiver.

f. Installing the Receiver Fuseable Plug. To install the fuseable plug proceed as follows:

(1) Apply a thin coat of lead, white, basic-carbonate, type C, on the threads of the new pipe.

(2) Screw the plug into the receiver setting up gas tight.

(3) Purge the entire refrigeration system. (See par 43 c.)

(4) Add refrigerant to the system. (See par 44 a.)

(5) Test for leaks. (See par 40.)

55. SERVICING THE CONDENSER

a. Removing the Condenser. If proper diagnosis indicates that the condenser is in need of repair caused by leaks or a restriction in the condenser coils, the condenser must be removed as follows:

(1) Remove the refrigerant from the system. (See par 44 b.)

(2) Apply torch and unsweat soldered connection at the outlet point of the receiver (fig 41, item 5).

(3) Remove discharge service valve from the compressor head.

(4) Apply torch and unsweat soldered connection on the discharge service valve and remove valve (fig 42).

(5) Remove the 4 supporting screws holding the condenser to the unit base (fig 41, item 6).

(6) Lift the condenser clear from the unit compartment.

b. Installing the Condenser. To install the condenser proceed as follows:

(1) Place the condenser in position on the condensing unit base and secure with the 4 supporting screws and nuts (fig 41, item 6).

(2) Connect the discharge service valve to the inlet end of the condenser line and resweat the soldered connection (fig 42).

(3) Connect the discharge service valve to the head of the compressor. (Use new gasket, 9R27142.)

(4) Connect outlet line of the condenser to the inlet point of the receiver by resweating the soldered connection (fig 41, item 5).

(5) Purge the entire refrigeration system. (See par 43 c.)

(6) Add refrigerant to the system. (See par 44 a.)

(7) Test for leaks. (See par 40.)

56. SERVICING THE COMPRESSOR BELT

a. Adjusting the Belt Tension. The belt should last an indefinite length of time if it has been operated under proper tension and the pulley is in proper alinement. Oil or lubricants of any kind should not be applied to the belt, and in the event that a slight stretching has occurred, the belt can easily be adjusted and the slack taken up. To adjust the belt tension proceed as follows:

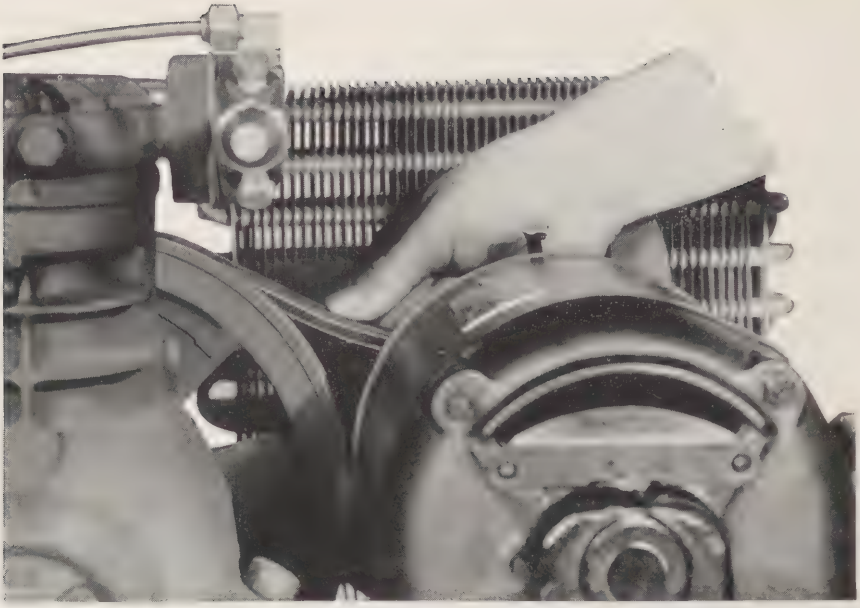


Figure 43. Inspecting belt tension.

(1) The tension of the belt should permit a depression of about ½ inch midway between pulleys as indicated in fig 43.

(2) Loosen the 4 nuts at the base of the motor and slide the motor away from the compressor to increase the tension, and toward the compressor to decrease the tension.

(3) Square the motor with the condensing unit base to secure proper alinement.

(4) Tighten the 4 nuts at the base of the motor.

b. Removing the Belt. To remove the belt proceed as follows:

(1) Disconnect the extension cord plug from the source of supply.

(2) Working from the front of the cabinet, grasp the compressor flywheel with the left hand at the upper portion of the outer edge.

(3) With the right hand guide the belt toward the rear of the cabinet (away from the compressor).

(4) With the left hand rotate the flywheel counter clockwise.

(5) As the belt frees from the flywheel, slip it over the motor pulley and fan, and remove the belt from the unit compartment.

c. Installing the Belt. To install the belt proceed as follows:

(1) Place one loop of the belt over the fan and fit into the motor pulley.

(2) Start the belt in the groove on top of the flywheel.

(3) With the right hand guide the belt at the top of the flywheel, and with the left hand guide the belt into position rotating flywheel counter clockwise.

(4) Adjust the belt for proper tension. (See par 56 a.)

57. SERVICING THE COMPRESSOR ASSEMBLY

a. Removing the Compressor. Except for replacing the cylinder head valve plate assembly, head gaskets, compressor service valves, oil and refrigerant, the compressor must be removed from the unit for any other servicing. To remove the compressor assembly proceed as follows:

(1) Pump down the system. (See par 41.)

(2) Disconnect the discharge and suction service valves from the compressor by removing 4 screws, SR01142. RESTRICTOR, 9R27130, WILL DROP WHEN SUCTION SERVICE VALVE IS REMOVED (FIG 39).

(3) Remove belt. (See par 56.)

(4) Remove the 4 screws, SR01013, from the base of the compressor.

(5) Remove the compressor with flywheel attached through front of cabinet (fig 44).

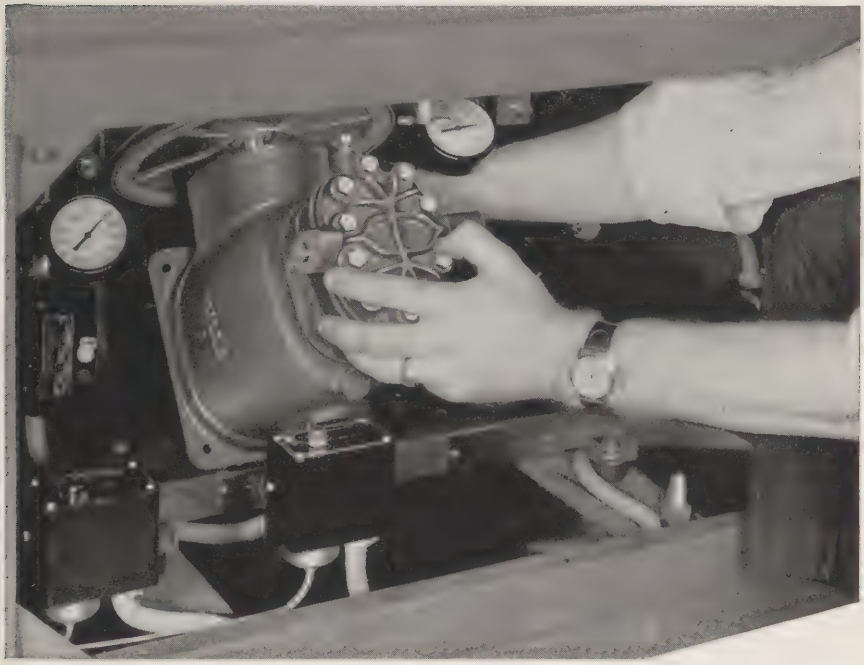


Figure 44. Removing compressor.

b. Installing the Compressor. To install the compressor proceed as follows:

(1) With flywheel attached, place compressor on condensing unit base.

(2) Secure compressor with 4 screws, SR01013, to the unit base.

(3) Connect the discharge and suction service valves with 4 screws. SR01142, to the compressor head using new gaskets, 9R27142. IN CONNECTING THE SUCTION SERVICE VALVE, MAKE CERTAIN THAT THE RESTRICTOR. 9R27130 (FIG 39, ITEM 2), IS ASSEMBLED BETWEEN THE 2 GASKETS.

(4) Purge the compressor body. (See par 43 a.)

(5) Install the pressure gage plug.

(6) Back seat the suction and discharge service valves.

(7) Remove the compound gage and install gage plug.

(8) Back seat the suction and discharge service valves and the liquid receiver valve.

(9) Install the 3 valve stem caps.

(10) Test for leaks. (See par 40.)

c. Removing the Compressor Flywheel. To service the shaft seal assembly, the compressor flywheel must be removed. To remove the flywheel proceed as follows:

(1) Remove the compressor. (See par 57 a.)

(2) Install the flywheel puller, TR00041, on the flywheel over shaft nut (fig 45, item 4).

(3) Tighten wheel puller bolts alternately with a wrench, TR01931 (fig 45, item 5), until flywheel snaps against the nut.

(4) Remove the flywheel puller, shaft nut, lockwasher and flywheel.

d. Installing the Compressor Flywheel. To install the flywheel proceed as follows:

(1) Reinstall flywheel on shaft.

(2) Secure flywheel to shaft with nut and lockwasher.

(3) Tighten nut. Due to taper of the shaft the flywheel is self-alining.

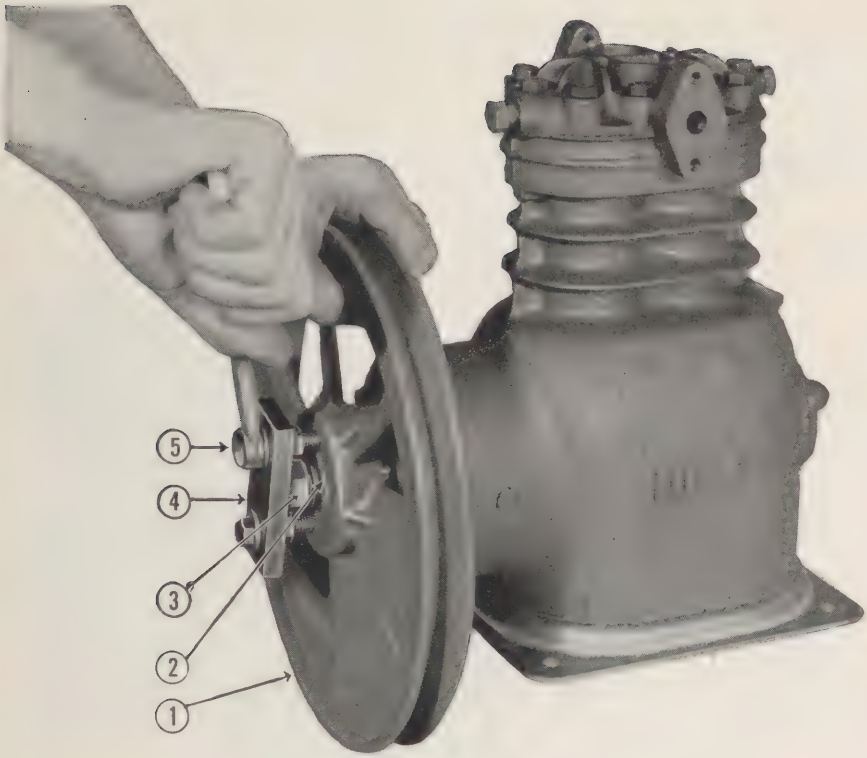


Figure 45. Removing the compressor flywheel.

Med. Dept. No.	Nomenclature
1. *9R27092*	*Flywheel, compressor, cylinder*
2. *SR01132*	*Washer, lock, screw size 9/16*
3. *SR00653*	*Nut, 9/16-18 hex.*
4. *TR00041*	*Puller, wheel, fly*
5. *TR01931*	*Wrench, 9/16 box*

e. *Removing the Eccentric Shaft Seal Assembly.* Should the seal face become scored or pitted by dirt or foreign substances, the seal will eventually leak releasing the refrigerant and oil. Should this happen, the seal assembly must be replaced. To remove the shaft seal assembly proceed as follows:

(1) Remove the compressor. (See par 57 a.)

(2) Remove the flywheel. (See par 57 c.)

(3) Lay compressor back (fig 46) to prevent the oil from leaking out of the crankcase.

(4) Remove the eccentric shaft seal cap and gasket by removing the 6 screws (fig 46).

(5) Remove the shaft seal assembly consisting of the eccentric shaft seal gasket, shaft seal ring, shaft seal shoulder and shaft shoulder gasket (fig 47).

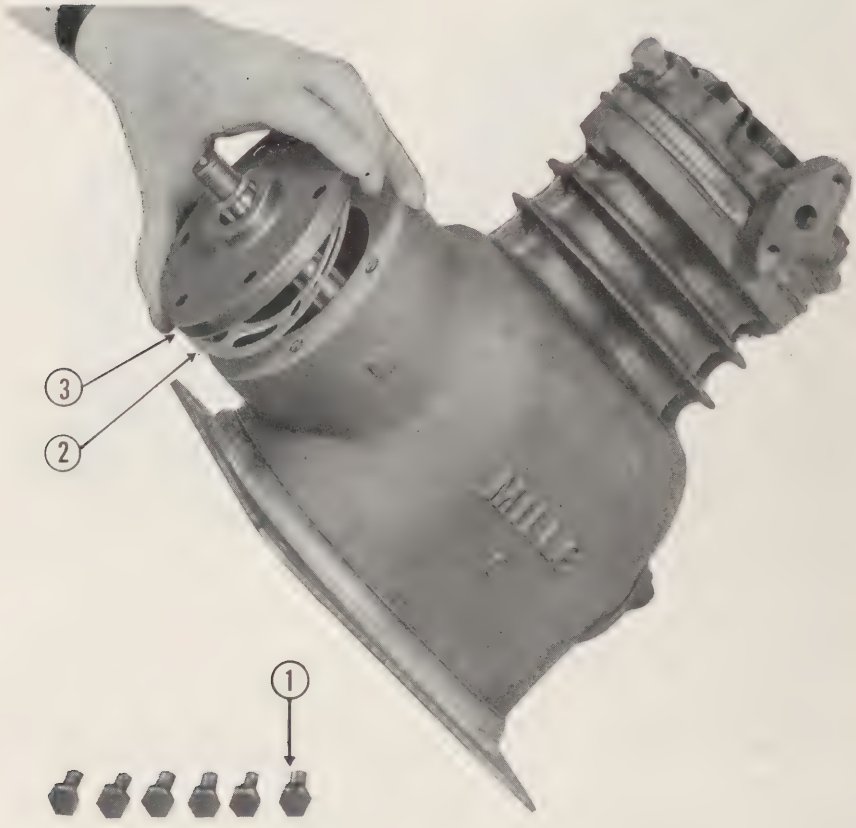


Figure 46. Removing the eccentric shaft seal assembly.

Med. Dept. No.	Nomenclature
1. *SR00935*	*Screw, 5/16-18 x 3/4 inch hex. hd. cap*
2. *9R27136*	*Gasket, cap, seal, shaft, eccentric*
3. *9R27124*	*Cap, seal, shaft, eccentric*

f. Installing the Eccentric Shaft Seal Assembly. To install the shaft seal assembly proceed as follows:

(1) Assemble the shaft seal gasket, 9R27114, in the recess of the shaft seal ring, 9R27112, and slide assembly (gasket end first) over shaft (fig 47).

(2) Coat the 2 faces of the sealing surfaces with refrigerant oil (OR).

(3) Assemble shaft seal shoulder, 9R27116, and shaft shoulder

gasket, 9R27118, into the shaft seal cap, 9R27124, and slide into position over the shaft. Use a new shaft seal cap gasket, 9R27136 (fig 47).

(4) Secure the assembly to the compressor by tightening the 6 cap screws, SR00935, drawing them up uniformly from side to side.

(5) Reinstall flywheel. (See par 57 d.)

(6) Install compressor. (See par 57 b.)

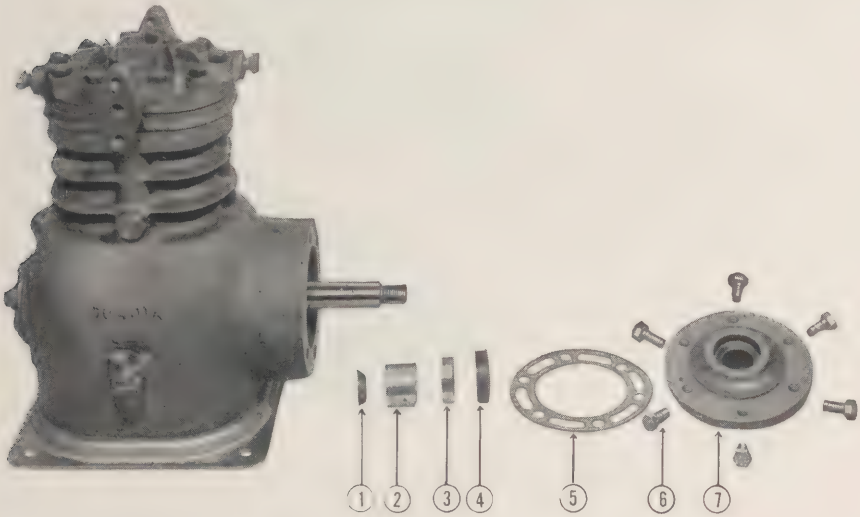


Figure 47. Eccentric shaft seal assembly removed.

	Med. Dept. No.	Nomenclature
1.	*9R27114*	*Gasket, seal, shaft, eccentric*
2.	*9R27112*	*Ring, seal, shaft, eccentric*
3.	*9R27116*	*Shoulder, seal, shaft, eccentric*
4.	*9R27118*	*Gasket, shoulder, shaft, eccentric*
5.	*9R27136*	*Gasket, cap, seal, shaft, eccentric*
6.	*SR00935*	*Screw, 5/16-18 x 3/4 inch hex. hd. cap*
7.	*9R27124*	*Cap, seal, shaft, eccentric*

g. Disassembly of Compressor. With the compressor body removed from the unit and the flywheel removed from the shaft as previously outlined, the compressor can be completely dismantled as follows:

(1) Remove the oil level plug (fig 48, item 1).

(2) Place the compressor on its side and allow the oil to drain from the crankcase into a receptacle.

(3) Remove the oil pan (fig 48, item 2) by the removal of 12 cap screws located under the pan. Lightly tap the oil pan to break the gasket adhesion.

(4) Remove the eccentric shaft seal assembly. (See par 57 e.)

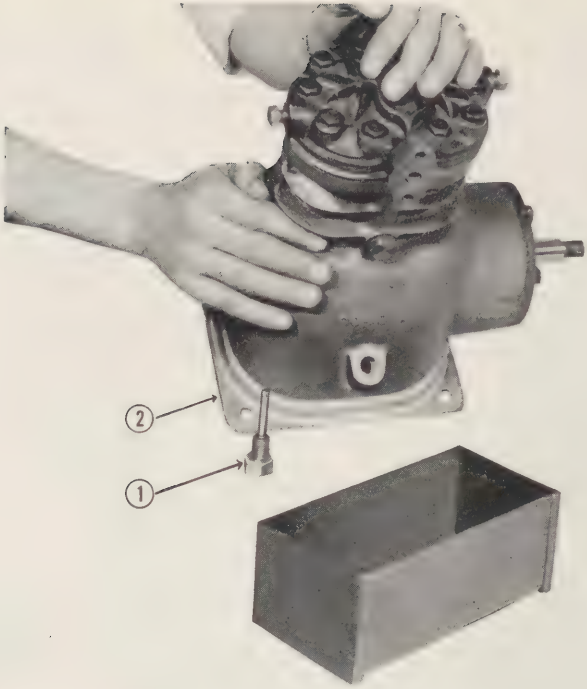


Figure 48. Removing oil from compressor.

Med. Dept. No.	Nomenclature
1. *9R27068*	*Plug, level, oil*
2. *9R27120*	*Pan, oil, cylinder, compressor*

(5) Remove the shaft thrust cap (fig 49, item 2) at thrust end of shaft by the removal of 3 cap screws (fig 49, item 1). CAUTION: WHEN THE SHAFT THRUST CAP IS REMOVED, THE SHAFT THRUST BALL (FIG 49, ITEM 4) AND THE SHAFT THRUST DISC (FIG 49, ITEM 5) WILL DROP OUT DUE TO THE TENSION OF THE SHAFT THRUST SPRING (FIG 49, ITEM 6).

(6) Remove the shaft thrust spring from the hollow of the shaft.

(7) Remove the Allen set screw located in the center of the compressor eccentric (fig 50, item 1).

(8) To remove the Allen set screw, it may be necessary to aline the eccentric. This can be done by replacing the flywheel nut on the shaft and rotating the shaft by means of a wrench (fig 50, item 6).

(9) Retain alinement of eccentric with the pistons by spanning

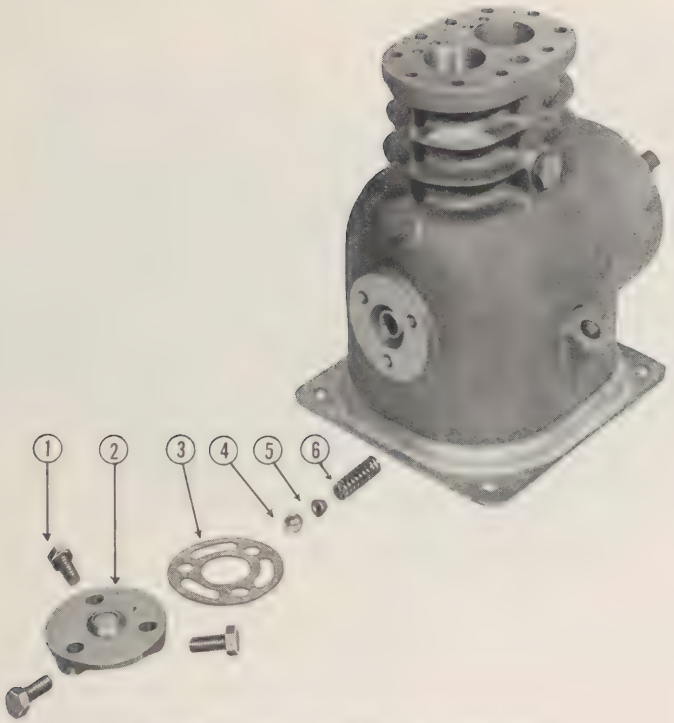


Figure 49. Eccentric shaft thrust cap removed.

	Med. Dept. No.	Nomenclature
1.	*SR00935*	*Screw, 5/16-18 x 3/4 inch hex. hd. cap*
2.	*9R27122*	*Cap, thrust, shaft, eccentric*
3.	*9R27138*	*Gasket, cap, thrust, shaft, eccentric*
4.	*9R27104*	*Ball, thrust, shaft, eccentric*
5.	*9R27106*	*Disc, thrust, shaft, eccentric*
6.	*9R27102*	*Spring, thrust, shaft, eccentric*

the shaft with a 10 inch adjustable wrench, TR01882, at a point between the eccentric and the seal end main bearing as illustrated in fig 51. The procedure will prevent breaking the connecting rod as the shaft is forced out of the compressor

(10) Drive the shaft from the thrust end by using a driving bar to prevent damage to the thrust end of the shaft (fig 51).

(11) Remove the pistons, connecting rods and eccentric as an assembly as indicated in fig 52.

(12) If the original parts are to be used, mark the skirt of the piston, wrist pin end plug, connecting rod and eccentric with the edge of a file. This is for the purpose of identification and must be followed during reassembly in order to reinstall the same parts to their original location. MARK 1 SET ONLY AS ILLUSTRATED IN FIG 52.

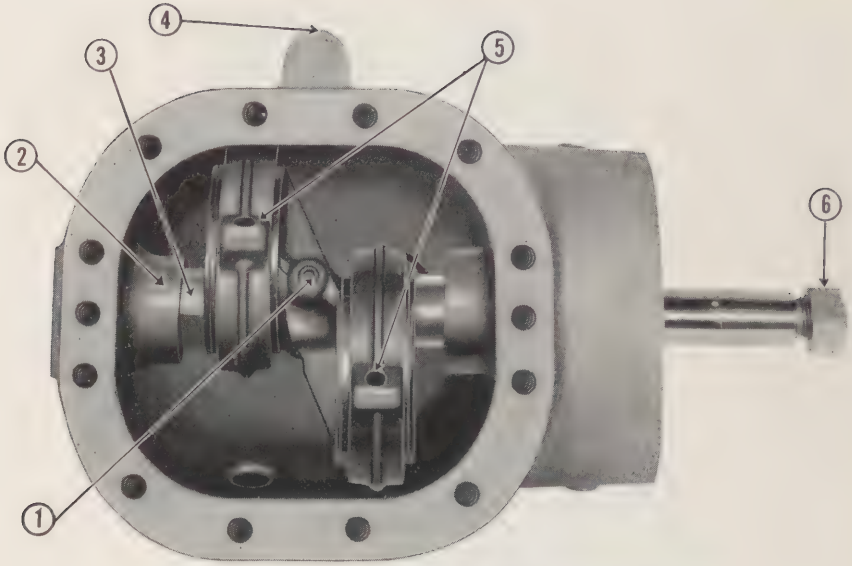


Figure 50. Removing the Allen set screw from compressor eccentric.

Med. Dept. No.	Nomenclature
1. SR01052	*Screw, 5/16-18 x 3/8 inch Allen head*
2.	*Thrust end of compressor*
3.	*Eccentric boss*
4.	*Oil level gage plug hole*
5.	*Connecting rod oil holes*
6. SR00653	*Nut, 9/16-18 hex.*

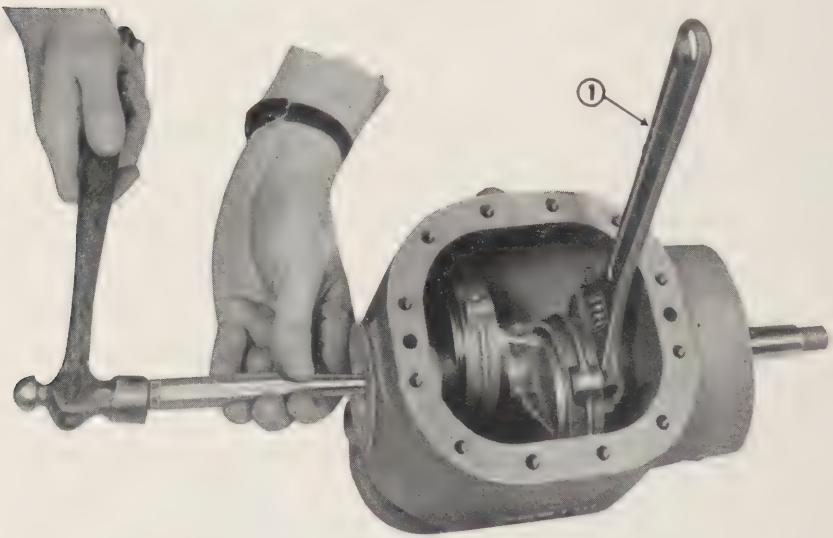


Figure 51. Removing compressor shaft.

Med. Dept. No.	Nomenclature
1. TR01882	*Wrench, 10" adjustable*

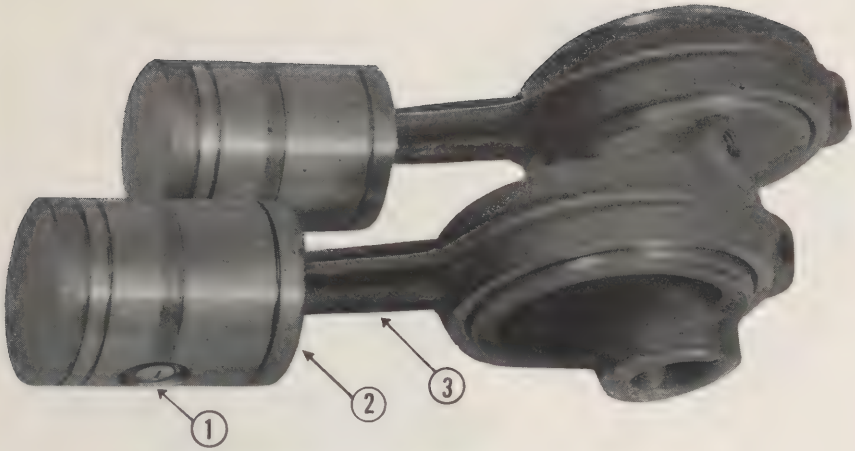


Figure 52. Marking of compressor parts for reassembly.

	Nomenclature	
1.	*Wrist pin end plug*	2. *Skirt of piston*
	3. *Connecting rod*	

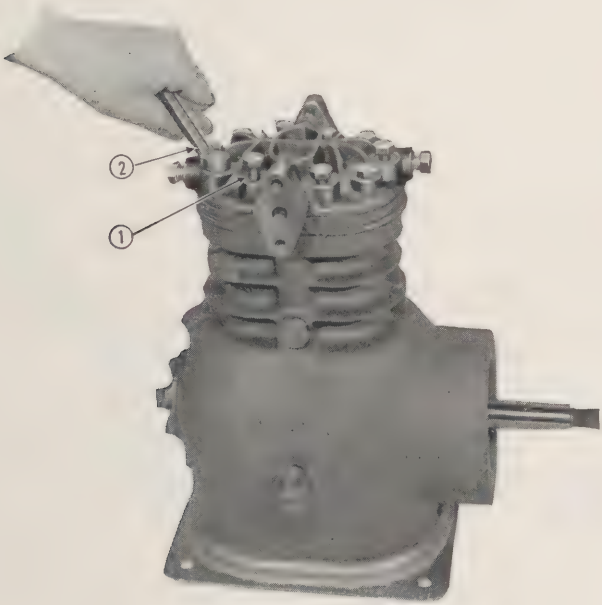


Figure 53. Removing compressor head.

Med. Dept. No.	Nomenclature
1. *SR01139*	*Screw, 5/16-18 x 1 7/8 inch hex. hd. cap*
2. *TR01931*	*Wrench, 9/16 box*

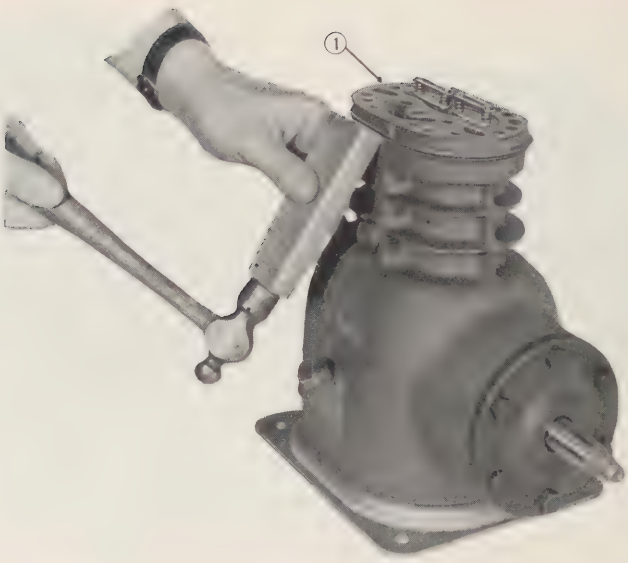


Figure 54. Removing the cylinder head valve plate assembly.

Med. Dept. No.	Nomenclature
1. 9R27074	*Plate, valve, head, cylinder*

(13) Remove the 10 cap screws from the compressor head (fig 53) and remove the head and valve plate assembly by striking these parts lightly using a wooden block to break the gasket adhesion (fig 54).

(14) In the event of a broken connecting rod and the piston damaged, the piston can be forced out by driving it down through the crankcase.

(15) To remove the piston from a broken connecting rod, pry out the wrist pin end plugs (fig 55) and drive the wrist pin from the piston and connecting rod using a brass rod to avoid injury to the wrist pins and wrist pin bores.

(16) Disassemble cylinder head valve plate assembly (fig 56) by depressing the valve plate discharge reed locks (fig 57, item 5) and removing the reed discharge screws (fig 57, item 6). This releases the discharge reed springs (fig 57, item 4), discharge reed cushions (fig 57, item 3), and discharge reeds (fig 57, item 2). The suction reeds (fig 58, item 2) can be disassembled by removing the suction reed screws (fig 58, item 3).

Figure 55. Removing wrist pin end plug.

1. Wrist pin end plug

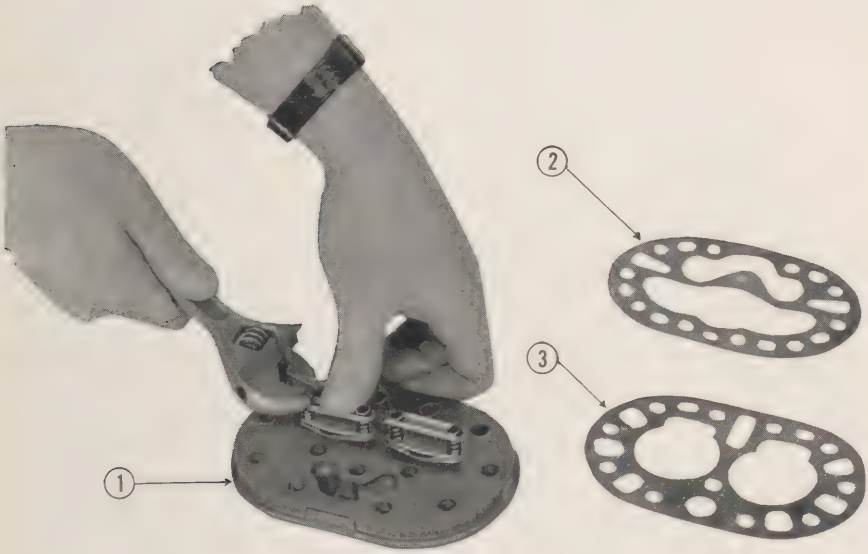


Figure 56. Disassembling cylinder head valve plate assembly.

Med. Dept. No.	Nomenclature
1. 9R27074	*Plate, valve, head, cylinder*
2. 9R27134	*Gasket, plate, head, cylinder*
3. 9R27132	*Gasket, head, cylinder*

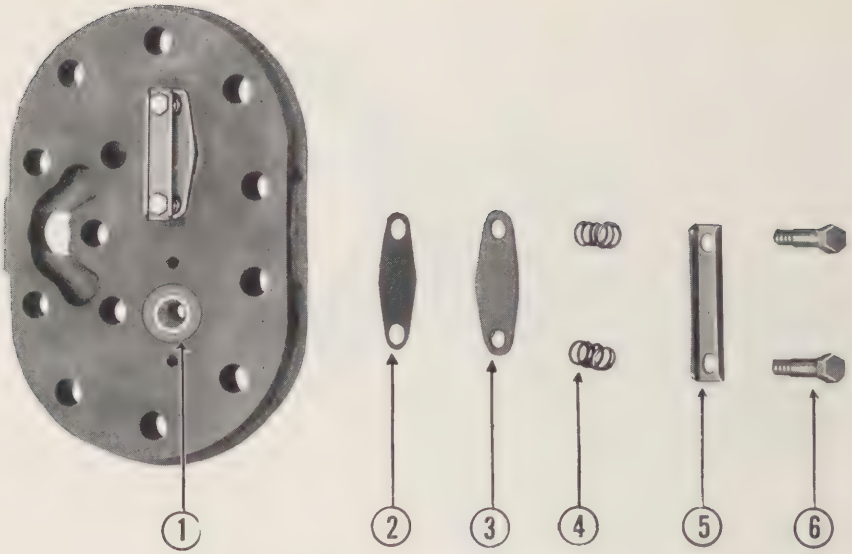


Figure 57. Discharge valve reed disassembled.

	Med. Dept. No.	Nomenclature
1.		*Discharge valve seat*
2.	*9R27080*	*Reed, discharge, plate, valve*
3.	*9R27084*	*Cushions, discharge, reed, plate, valve*
4.	*9R27082*	*Spring, reed, discharge, plate, valve*
5.	*9R27088*	*Locks, discharge, reed, plate, valve*
6.	*9R27086*	*Screw, discharge, reed, plate, valve*

h. Reassembling the Compressor. Each part should be thoroughly inspected and any part showing excessive wear should be replaced. A complete new set of compressor gaskets must be used and all surfaces free of old gasket material. Every precaution must be taken to prevent dirt or moisture from getting on the parts during the reassembling. To reassemble the compressor proceed as follows:

(1) Before reassembling, clean all parts thoroughly by immersing them in carbon tetrachloride or a dry cleaning solvent, using a stiff brush to completely wash the dirt and dust from all grooves, crevices and holes.

(2) If the original parts are to be used, the markings must be followed making sure that the same pistons and wrist pins are installed on the same connecting rods and are assembled back in the same cylinders.

Figure 58. Suction valve reed disassembled.

Med. Dept. No.	Nomenclature
1.	*Suction valve seat*
2. 9R27076	*Reed, suction, valve, plate*
3. 9R27078	*Screws, reed, suction, plate, valve*

(3) Assemble pistons to connecting rods by placing refrigerant oil on the wrist pins and insert the wrist pins through the pistons and connecting rods. Make sure there is an even clearance on each end of the wrist pins. If it is necessary to drive the wrist pins use a brass rod to avoid injury to wrist pins and wrist pin bores. Assemble wrist pin end plugs (fig 55) into the wrist pins by depressing plugs into place.

(4) Assemble the connecting rods on the eccentric as illustrated in fig 52. Place refrigerant oil on the eccentric bearing surfaces (fig 50). Be sure the oil holes (item 5) on the connecting rods face toward the oil level gage plug hole (item 4) and the boss (item 3) of the eccentric faces towards the thrust end (item 2) of the compressor.

(5) Stand the compressor with the crankcase up and oil the pistons with refrigerant oil. Insert the pistons, connecting rods and eccentric assembly through the crankcase and fit pistons into cylinders alining shaft opening in eccentric with main bearings of the compressor (fig 50).

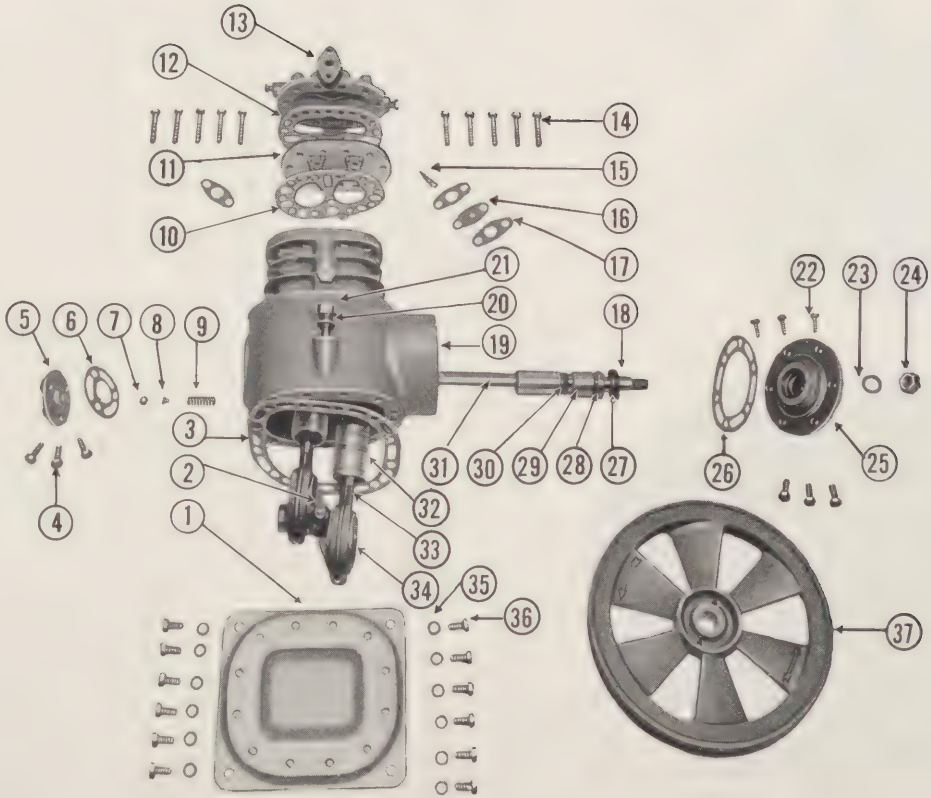


Figure 59. Compressor disassembled.

	Med. Dept. No.	Nomenclature
1.	9R27120	Pan, oil, cylinder, compressor
2.	SR01052	Screw, 5/16-18 x 3/8 inch Allen head
3.	9R27140	Gasket, pan, oil
4.	SR00935	Screw, 5/16-18 x 3/4 inch hex. hd. cap
5.	9R27122	Cap, thrust, shaft, eccentric
6.	9R27138	Gasket, cap, thrust, shaft, eccentric
7.	9R27104	Ball, thrust, shaft, eccentric
8.	9R27106	Disc, thrust, shaft, eccentric
9.	9R27102	Spring, thrust, shaft, eccentric
10.	9R27132	Gasket, head, cylinder
11.	9R27074	Plate, valve, head, cylinder
12.	9R27134	Gasket, plate, head, cylinder
13.	9R27090	Head, cylinder, compressor
14.	SR01139	Screw, 5/16-18 x 1 7/8 inch hex. hd. cap
15.	9R27126	Strainer, suction, head, cylinder
16.	9R27130	Restrictor, valve, service, suction
17.	9R27142	Gasket, service, valve
18.	9R27098	Shaft, eccentric, compressor
19.	9R27128	Block, cylinder, compressor
20.	9R27232	Gasket, plug, level, oil
21.	9R27068	Plug, level, oil
22.	SR00935	Screw, 5/16-18 x 3/4 inch hex. hd. cap
23.	SR01132	Washer, lock, screw size 9/16
24.	SR00653	Nut, 9/16-18 hex.
25.	9R27124	Cap, seal, shaft, eccentric
26.	9R27136	Gasket, cap, seal, shaft, eccentric
27.	9R27118	Gasket, shoulder, shaft, eccentric
28.	9R27116	Shoulder, seal, shaft, eccentric
29.	9R27112	Ring, seal, shaft, eccentric
30.	9R27114	Gasket, seal, shaft, eccentric
31.	9R27100	Key, eccentric, shaft, compressor
32.		Compressor piston
33.	9R27094	Piston and connecting rod, compressor
34.	9R27096	Eccentric, compresssor
35.	SR00156	Washer, lock, screw 5/16
36.	SR01013	Screw, 5/16-18 x 5/8 inch hex. hd. cap
37.	9R27092	Flywheel, compressor, cylinder

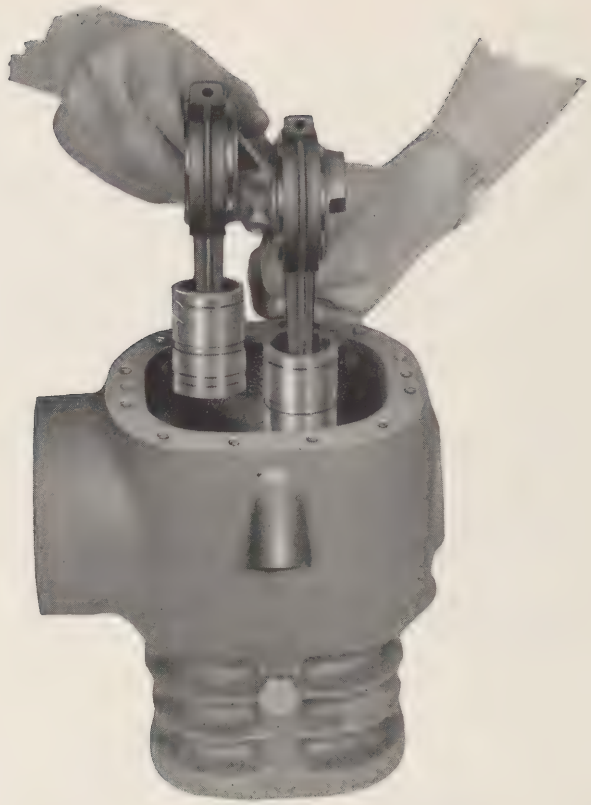


Figure 60. Installing piston assembly into compressor.

(6) With compressor shaft key, 9R27100 (fig 59, item 31), in slot of shaft, insert shaft through seal housing end of compressor alining key with keyway of eccentric. Place flywheel nut on shaft and drive the shaft into position using a wooden mallet or similar soft composition to avoid injury to the threads and shaft. Secure eccentric to shaft by tightening the Allen set screw (fig 50, item 1) in the eccentric.

(7) Insert the shaft thrust spring in the thrust end of the shaft and assemble the shaft thrust disc and shaft thrust ball into position (fig 49). With the shaft thrust disc and shaft thrust ball in position, reinstall the shaft thrust cap with the 3 cap screws. (Use new gasket, 9R27138.) Tighten the cap screws evenly.

(8) Reinstall the eccentric shaft seal assembly. (See par 57 f.)

(9) Reinstall the oil pan (using new gasket, 9R27140) with 12 cap screws and lockwashers, tightening evenly from side to side.

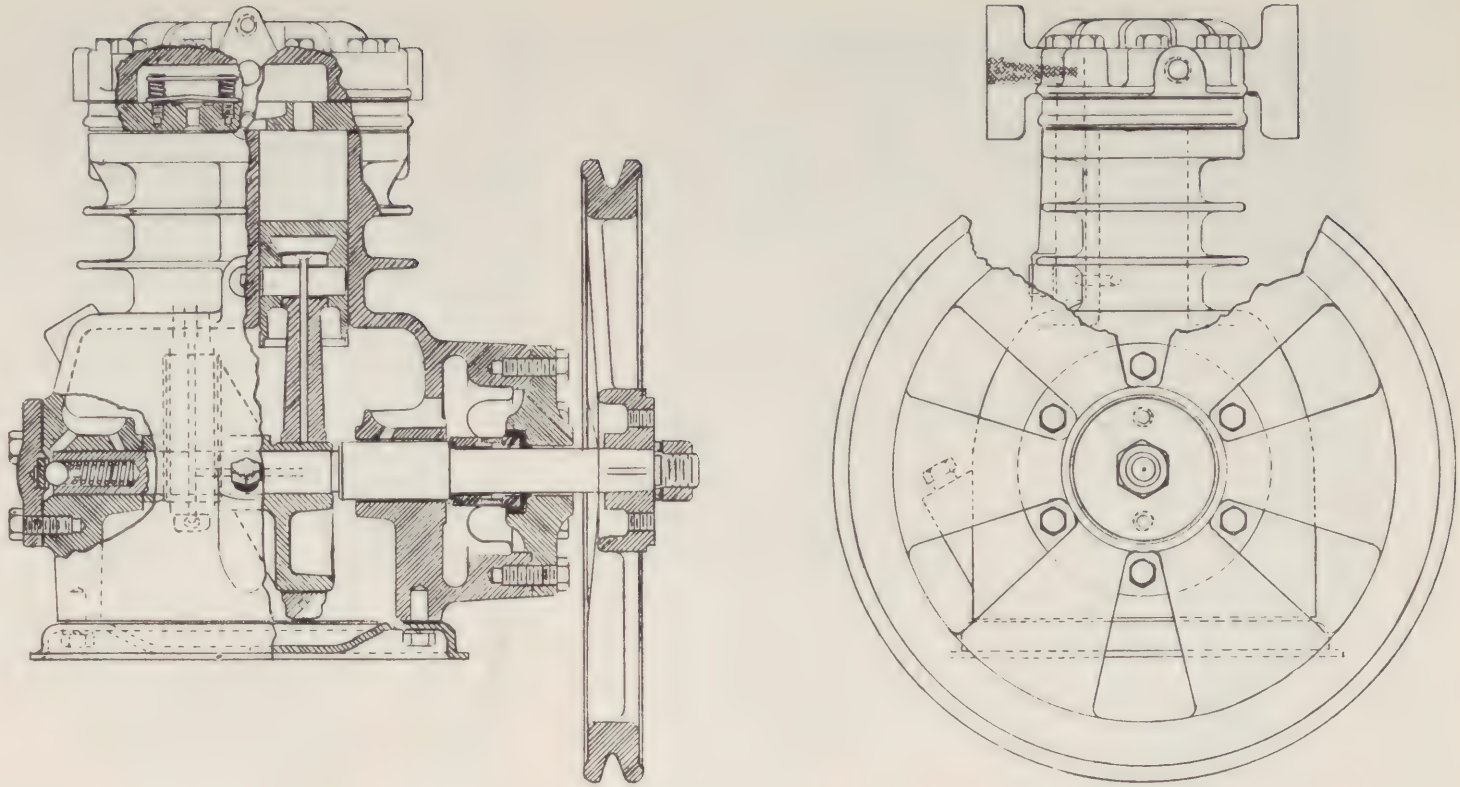


Figure 61. Cross section of compressor assembly.

(10) Reassemble cylinder head valve plate assembly making sure that the seats are absolutely clean. If cleaning is necessary, use a chamois if available. If new parts are not needed, care should be taken making sure the old parts are installed in their original position. In assembling the discharge valve reeds, aline components as illustrated in fig 57. Either side of reed may be used as a seating surface. Assemble the suction valve reeds on the opposite side of the valve plate with the curvatures up to create tension on the seating surfaces. Secure the reeds to the plate with the 4 suction reed screws (fig 58).

(11) Place a few drops of refrigerant oil on the heads of the pistons and install the cylinder head valve plate assembly on the compressor using 2 new gaskets, 9R27132 and 9R27134. The valve plate assembly and gaskets will only fit in their correct position when holes are properly alined.

(12) Reinstall the compressor head with the 10 cap screws drawing the screws up gas tight working evenly from side to side.

NOTE: The compressor head can only be installed in its correct position due to its contour and fit in the valve plate assembly.

(13) Inspect the cylinder head suction strainer making sure that it is not restricted. Insert the strainer into the suction port of the compressor (fig 38).

(14) Remove the oil level plug, and with the aid of a funnel fill the crankcase with 1¾ pints of pure dehydrated refrigerant oil (OR) (fig 23). Reinstall the oil level plug making sure that the plug gasket is in place under the hex head of the plug.

(15) Reinstall the flywheel on the compressor shaft. (See par 57 d.)

58. SERVICING THE ELECTRIC MOTOR

a. Motor Rotation Adjustment. The electric motor is of the reversible type, but should only be operated in one direction on this refrigerator. That direction is counter clockwise when facing the commutator end of the motor. Any adjustment of the brush setting should not be required; however, should the setting be accidently moved, it must be reset to insure the proper starting torque and rotation of the motor. To adjust the rotation proceed as follows:

(1) To change the adjustment indicated by markings on fig 62, loosen the screw (item 1) and aline mark evenly with the mark indicated on the end plate. This is a very critical adjustment and care must be exercised in bringing the 2 marks to perfect alinement. The marking on the right (item 3) is the one to aline with the end plate marking (item 4) to insure proper rotation of the motor. After making the adjustment, tighten the screw (item 1) thereby locking the adjustment in place.

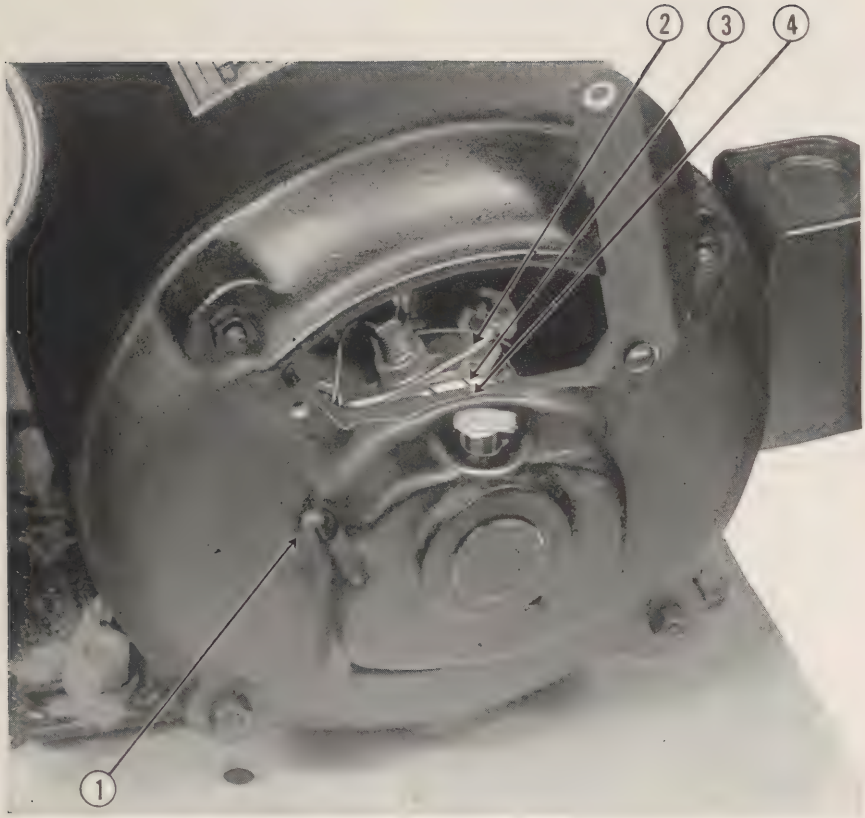


Figure 62. Adjusting motor rotation.

Figure 63. Cleaning the motor commutator.

1. *Inspection cover plate*

b. Cleaning the Motor Commutator. The motor commutator will require cleaning due to accumulation of oil and dust. Excessive arcing and sluggish starting are the results of this condition. To clean the commutator proceed as follows:

(1) Remove the inspection cover plate (item 1) on the end plate of the motor (fig 63).

(2) With the motor in operation gently hold a piece of fine grade sandpaper against segments of the commutator long enough to remove the dirt accumulation. (DO NOT USE EMERY PAPER.)

(3) Replace the inspection cover plate and secure with 2 screws.

c. Removing the Electric Motor Carbon Brushes. Worn motor brushes are indicated by sluggish starting, excessive arcing or failure to start the motor. To remove the motor brushes proceed as follows:

(1) Disconnect the extension cord plug from the source of supply.

(2) Remove the 4 nuts from the end plate bolts.

(3) Remove the end plate by tapping around the flange until plate is free and can be removed from the shaft.

(4) Lift brush holder spring and move to one side freeing brushes for removal. (BRUSHES MUST ALWAYS BE REPLACED IN SETS OF 4 — 2 PAIRS.)

d. Installing the Electric Motor Carbon Brushes. To install the new brushes proceed as follows:

(1) Insert the new brushes in the brush holder and bend the brush holder springs in position so they rest on top of the brushes.

(2) Replace end plate on shaft by guiding the index plate through the slot in the brush holder.

(3) Tap flange to secure the end plate to the motor frame and install nuts on the end plate bolts. Tighten the bolts uniformly by alternating from side to side. In tightening the bolts inspect the armature for free movement at intervals to assure proper alinement. Should the end plate fail to aline properly by tightening the bolts, tap lightly around the flange of the end plate until it fits snugly against the motor frame.

(4) Reconnect the extension cord plug to the source of supply.

e. Testing the Field Coils for Short Circuit. To test the field coils proceed as follows:

(1) Remove the armature. (See par 58 h.)

(2) Make a separate watt meter reading on the field coil windings. In some cases the short circuited coil may be located by feeling

the coils and noting if one feels much hotter than the other.

(3) The presence of an increase in the magnetic noise over and above the normal noise may also indicate a short circuited field coil.

(4) Should an inspection indicate that the coils are short circuited the motor must be replaced.

f. Testing the Armature for Short Circuit. To test the armature proceed as follows:

(1) Remove the brushes. (See par 58 c.)

(2) Reinstall the end plate on the motor.

(3) Remove the belt. (See par 56 b.)

(4) Reconnect the extension cord plug to the source of supply.

(5) Turn the fan to rotate the armature within the field coils and motor housing. If the armature rotates uniformly throughout the complete revolution, the armature coils are not short circuited. Should the armature tend to stop or drop forward or backward of its own accord, then the armature winding is shorted and the armature must be replaced.

g. Testing the Field Coils or Armature for Open Circuit. If an inspection indicates the following symptoms the motor must be replaced (See par 58 l.)

(1) Excessive sparking when the motor starts.

(2) Refusal to start at certain positions of the armature.

(3) A humming sound when the circuit to the motor is closed.

h. Removing the Armature. To remove the armature proceed as follows:

(1) Remove the motor. (See par 58 l.)

(2) Remove the pulley end plate by removing the 4 end plate bolts and nuts.

(3) Remove the end plate by tapping around the flange until the plate is free and can be removed from the shaft.

(4) Grasp the shaft and pull the armature forward until it is clear of the field coils and motor frame (fig 64).

i. Installing the Armature. To install the armature proceed as follows:

(1) Slide the armature into the motor frame by placing the pulley end of the shaft into the pulley end plate. Should difficulty be experienced in sliding the shaft through the motor end plate bearing, remove the armature and with your finger work the

Figure 64. Removing the armature.

oil wicking back into the oil well. This will prevent obstruction and allow the motor shaft to pass into the end plate bearing.

(2) Replace end plate and secure with end plate bolts and nuts. Should the end plate fail to aline by tightening the bolts, tap lightly around the flange until it fits snugly against the motor frame.

(3) Replace the motor on the condensing unit as outlined in par 58 l.

j. Removing the Overload Protector. The motor is equipped with a built-in overload protector. The principle upon which this protective device functions is a thermostatic circuit breaker. When the temperature of the motor rises above normal operating conditions, the circuit is broken, stopping the motor and permitting it to cool to a normal temperature. When the normal temperature again prevails the protector control closes the circuit and the motor resumes operation. This cycle of intermittent operation may continue a number of times until the condi-

tion that is causing the overload is corrected or the equipment is down to normal and continuous operation is resumed. The protector is set at the factory and no adjustments should be made in the field. If intermittent operation continues with all conditions normal, and it is determined that the difficulty lies within this protective device, it must be replaced. To remove the overload protector proceed as follows:

(1) Remove the motor as outlined in par 58 l.

(2) Remove pulley end plate by removing the end plate nuts and bolts, and tapping around the flange until the plate is free and can be removed from the shaft (fig 65, item 4).

(3) Remove screw (fig 65, item 2) retaining overload protector in recess of the end plate.

(4) Remove tape and fibre cover (fig 65, item 1) exposing 4 soldered terminals. (NOTATION MUST BE MADE OF COLOR CODE OF CABLES AND THEIR RESPECTIVE ATTACHED POSITIONS.) Unsolder terminals and remove wiring.

k. Installing the Overload Protector. To install the overload protector proceed as follows:

(1) Resolder leads to the terminals in accordance with color code.

(2) Retape fibre cover in position.

(3) Assemble overload protector in recess of the end plate and secure with clamp and screw.

(4) Reassemble end plate over shaft securing end plate with bolts and nuts. Should the end plate fail to aline by tightening the bolts, tap lightly around the flange until it fits snugly against the motor frame.

(5) Replace the motor on the condensing unit as outlined in par 58 l. CAUTION: DO NOT TIGHTEN MOTOR PULLEY ON THE SHAFT UNTIL AFTER THE MOTOR HAS BEEN REPLACED ON THE CONDENSING UNIT AND MOTOR PULLEY ALINED WITH THE FLYWHEEL.

l. Removing the Motor for Repairs. To remove the motor for repairs proceed as follows:

(1) Remove the belt. (See par 56 b.)

(2) Remove the motor junction box cover and unsolder the electrical connections.

(3) Remove cables from the junction box.

(4) Remove the 4 nuts and lockwashers from the motor base.

(5) Motor is now free and can be removed from the machine compartment.

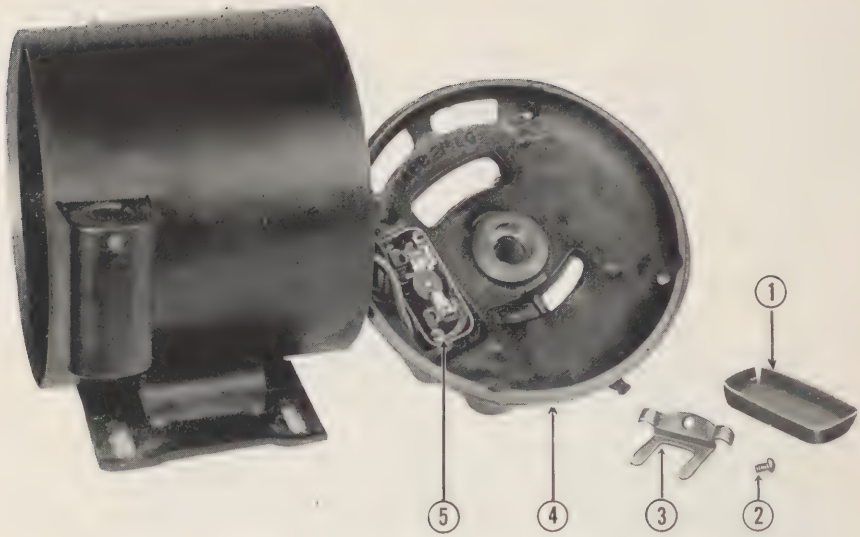


Figure 65. Removing the overload protector.

Med. Dept. No.	Nomenclature
1.	*Overload fibre cover*
2.	*Overload protector clamp screw*
3.	*Overload protector clamp*
4.	*End plate (pulley)*
5. *9R27158*	*Protector, overload*

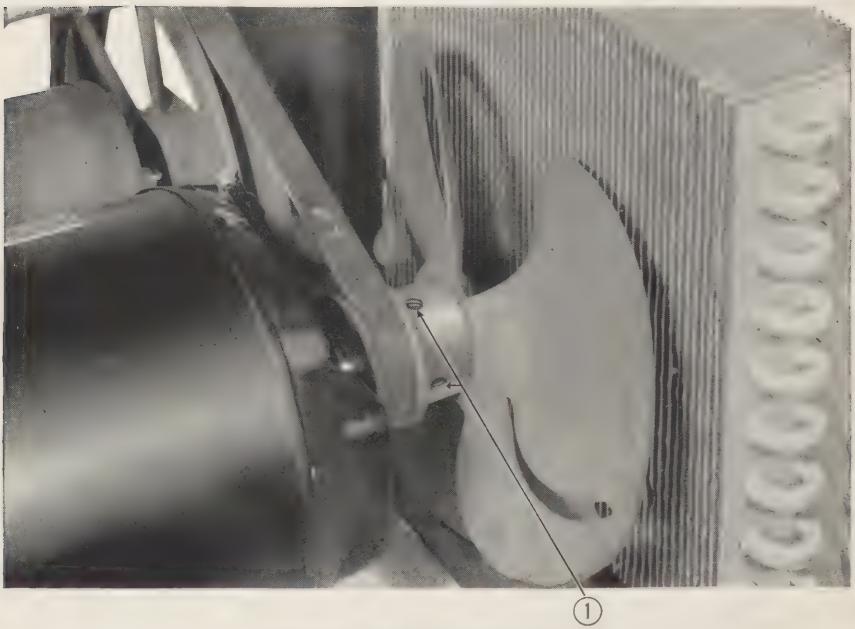


Figure 66. Removing motor pulley.

Med. Dept. No.	Nomenclature
1. *SR01052*	*Screw, 5/16-18 x 3/8 inch Allen head*

(6) Remove the motor pulley with the fan attached from the motor shaft by loosening the 2 Allen set screws located in the pulley hub (fig 66, item 1).

(7) Remove key from motor shaft.

m. Installing the Motor. To install the motor proceed as follows:

(1) Replace the key on the motor shaft and install the motor pulley with fan attached to the motor shaft. (DO NOT TIGHTEN THE 2 ALLEN SET SCREWS LOCATED IN THE PULLEY HUB (FIG 66) UNTIL AFTER THE MOTOR HAS BEEN INSTALLED ON THE CONDENSING UNIT BASE.)

(2) Install the motor on the condensing unit base and aline motor base with motor bolts.

(3) Secure motor to the condensing unit base with the 4 lockwashers and nuts leaving the nuts loose until the pulley alinement has been established.

(4) Install the belt. (See par 56 c.)

(5) Aline the pulley with the flywheel and tighten the 2 Allen set screws in the pulley hub (fig 66).

(6) Establish the proper belt tension (see par 56 a) and tighten the motor bolts.

(7) Reinstall the electrical cables and solder the connections making certain that the color code as outlined in the wiring diagram (fig 5) is followed.

(8) Tape the soldered connections and reinstall the junction box cover.

(9) Connect the extension cord plug to the source of supply.

n. Disassembling the Motor for Repairs. To disassemble the motor for repairs proceed as follows (fig 68):

(1) Remove the motor for repair. (See par 58 l.)

(2) Remove the 4 end plate bolts and nuts (item 15) and slide the bolts from the motor frame.

(3) Remove the front end plate (item 3) by tapping the flange of the plate until it is free and can be removed from the shaft.

(4) Grasp the shaft and pull the armature forward until it is clear of the field coils and motor frame.

(5) Stand the armature on end (fig 67) and with a screw driver depress the governor spring retainer (item 9) and remove the retainer spring washer (item 10) governor spring retainer (item 9) starting spring (item 8) retainer spring extension (item 6) and retainer spring washer (item 7).

(6) Remove the brush holder assembly (item 5) and turn the armature (item 1) with the commutator end down permitting the stator spring retainer (item 4) short-circuit starting necklace (item 3) and governor push rods (item 2) to drop out.

(7) Remove the pulley end plate (fig 68, item 20) by tapping the flange until it is free from the motor frame.

(8) Remove screw (fig 68, item 22) retaining overload protector in the recess of the plate.

(9) Remove tape and fibre cover exposing 4 soldered terminals. (NOTATION MUST BE MADE OF COLOR CODE OF CABLES AND THEIR RESPECTIVE ATTACHED POSITIONS.) Unsolder terminals and remove wire.

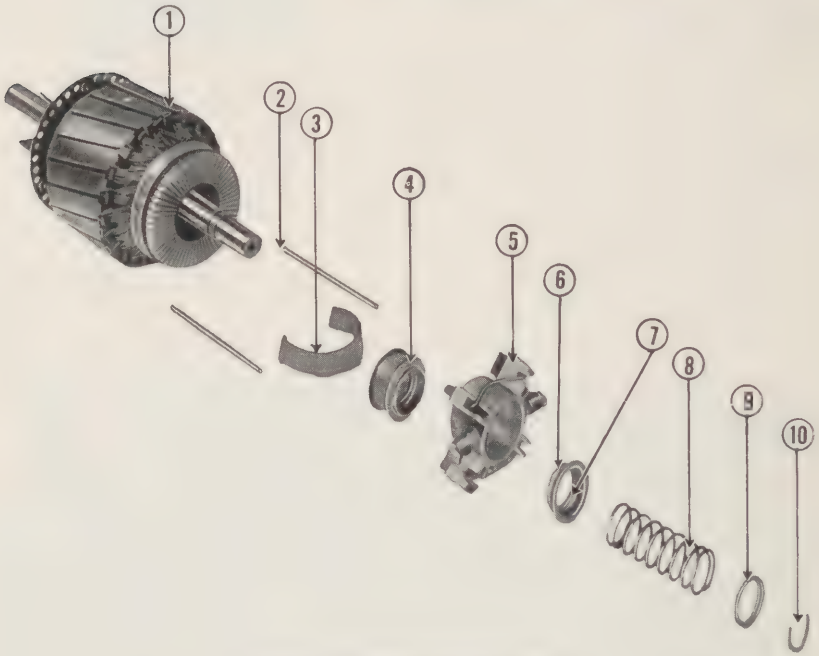


Figure 67. Armature disassembled.

	Med. Dept. No.	Nomenclature
1.	*9R27162*	*Armature*
2.	*9R27178*	*Rod, push, governor*
3.	*9R27176*	*Necklace, starting, circuit, short*
4.	*9R27170*	*Retainer, spring, stator*
5.	*9R27156*	*Holders, brush*
6.	*9R27174*	*Extension, spring, retainer*
7.	*9R27172*	*Washer, spring, retainer*
8.	*9R27180*	*Spring, starting*
9.	*9R27186*	*Retainer, spring, governor*
10.	*9R27184*	*Washer, spring, retaining*

o. *Reassembling the Motor.* Before reassembling the motor all parts should be thoroughly cleaned and inspected. Parts found to be worn must be replaced. To reassemble the motor proceed as follows (fig 67).

(1) Stand armature (item 1) on pulley end of shaft and drop the 2 governor push rods (item 2) into position.

(2) Form the short-circuit starting necklace (item 3) around the stator spring retainer (item 4) and place it over the shaft into position.

(3) Place brush holder assembly (item 5) over shaft and insert the retainer spring extension (item 6) retainer spring washer (item 7) starting spring (item 8) and governor spring retainer (item 9) into the brush holder assembly.

(4) With a screw driver compress the governor spring retainer (item 9) and lock all parts in place by forcing the retainer spring washer (item 10) into the groove of the shaft provided for this purpose.

(5) Reassemble the overload protector (fig 68, item 18) by resoldering the leads to the terminals in accordance with the color code.

(6) Retape fibre cover into position.

(7) Reassemble overload protector in the recess of the end plate and secure with clamp and screw (fig 68, items 21 and 22).

(8) Reassemble pulley end plate (fig 68, item 20) on motor frame and slide end plate bolts (fig 68, item 15) through the end plate and motor frame. Should the end plate fail to aline, tap lightly around the flange until it fits snugly against the motor frame.

(9) Slide the armature into the motor frame by placing the pulley end of the shaft into the pulley end plate. Should difficulty be experienced in sliding the shaft through the end plate bearing, remove the armature and with your finger work the oil wicking back to the oil well.

(10) Replace the front end plate (fig 68, item 3) over the shaft by guiding the index plate through the slot in the brush holder.

(11) Secure the end plate to the motor frame with the end plate nuts. Tighten the nuts uniformly by alternating from side to side. While tightening the nuts inspect the free movement of the armature at intervals to assure correct alinement. Should the end plate fail to aline by tightening the bolts, tap lightly around the flanges of both end plates until they fit against the motor frame.

(12) Add 10 drops of "OE 10 engine oil" to each oil cup (fig 9, item 9).

(13) Reinstall the motor as outlined in par 58 l.

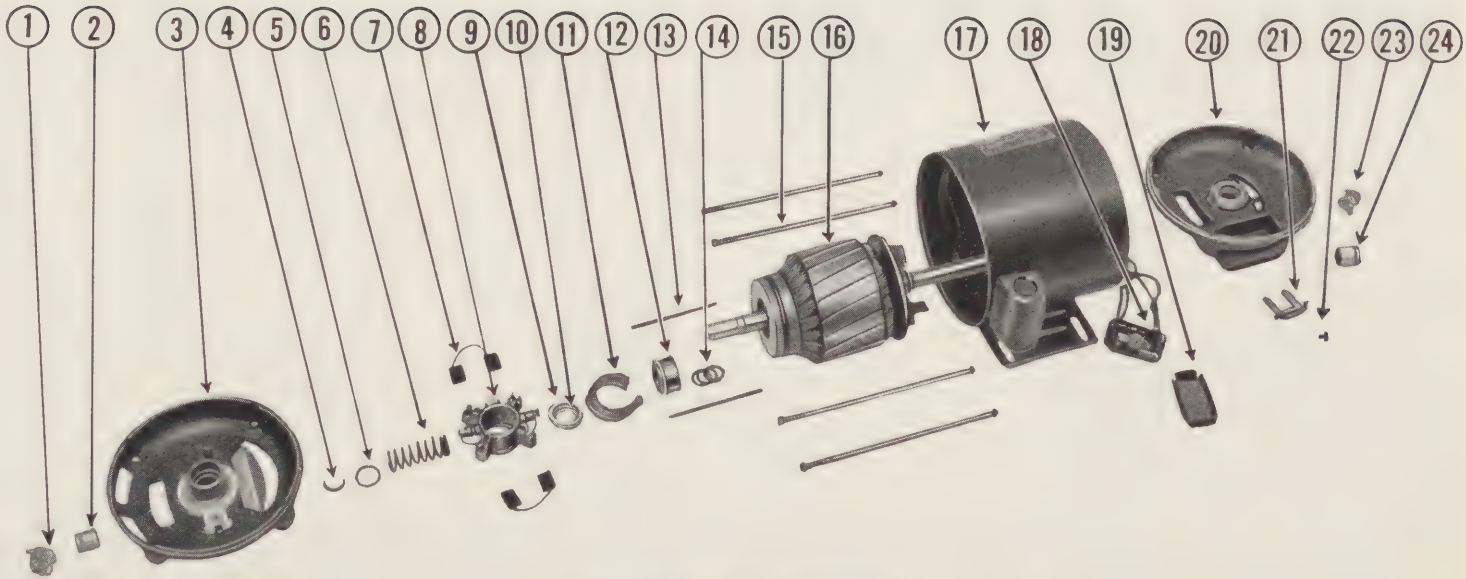


Figure 68. Electric motor disassembled.

	Med. Dept. No.	Nomenclature
1.	9R27166	*Wick, oil, bearing, front and rear*
2.	9R27164	*Bearings, front, armature*
3.		*End plate assembly (front)*
4.	9R27184	*Washer, spring, retaining*
5.	9R27186	*Retainer, spring, governor*
6.	9R27180	*Spring, starting*
7.	9R27154	*Brushes, carbon*
8.	9R27156	*Holders, brush*
9.	9R27174	*Extension, spring, retainer*
10.	9R27172	*Washer, spring, retainer*
11.	9R27176	*Necklace, starting, circuit, short*
12.	9R27170	*Retainer, spring, stator*

	Med. Dept. No.	Nomenclature
13.	9R27178	*Rod, push, governor*
14.		*Motor shims*
15.	9R27168	*Bolt and nut, end plate*
16.	9R27162	*Armature*
17.	9R27160	*Stator, armature*
18.	9R27158	*Protector, overload*
19.		*Overload fibre cover*
20.		*End plate assembly (pulley)*
21.		*Overload protector clamp*
22.		*Overload protector clamp screw*
23.	9R27166	*Wick, oil, bearing, front and rear*
24.	9R27164	*Bearing, front and rear, armature*

Section XVIII
Cabinet Repairs

59. SERVICING THE CABINET

a. Replacing the Door Gasket. The door gasket is formed into position by adhesion to the 4 sides of the jam faces of the door flange. To replace the door gasket proceed as follows:

(1) Grasp one end of the gasket where it joins at the bottom of the door. With a steady pull work the gasket from around the door.

(2) Remove any particles of the gasket that may have stuck to the surface of the door. The surface must be scraped clean in order for the new gasket to properly adhere. A dry cleaning solvent may be used if necessary.

(3) Remove the mastic paper from the adhesive surface of the new gasket and fit the gasket, 9R27012, into position around the door.

(4) Secure the gasket to the door by firmly pressing over the entire area of the gasket.

(5) After the gasket has been formed immediately close the door and permit the door to remain in a closed position for several minutes to assure proper adhesion.

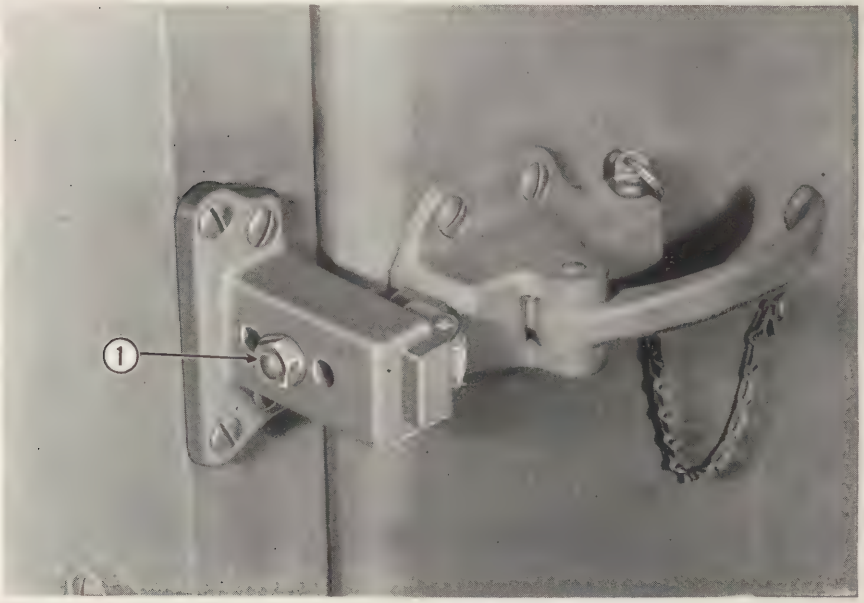


Figure 69. Adjusting the door latch strike.

1. Door strike nut

b. Adjusting the Door. Should an inspection of the new gasket indicate a difficulty in closing or air leakage due to insufficient contact, one or both of the following corrections must be made.

(1) Adjust the door latch strike (fig 69) by loosening the door strike nut (item 1) and disengaging the teeth on the bolt head from the teeth on the roller strike. By moving the roller strike in toward the cabinet an increased door gasket pressure can be obtained. After making the adjustment tighten the nut (item 1) on the door strike.

Figure 70. Adjusting door hinges.

1. *Door hinge shims*

(2) Adjust the door hinges by inserting or removing a shim in back of the hinges (fig 70). Unless the door or door frame is badly distorted, the adjustment of the roller strike and hinges should provide a satisfactory gasket pressure.

Figure 71. Removing the dial thermometer.

Med. Dept. No.	Nomenclature
1. *9R27038*	*Thermometer, dial*
2. *SR01136*	*Screw, 4-40 x 1/4 inch fl. hd. self-tapping*
3.	*Dial face ring*

c. Removing the Dial Thermometer. The indicating thermometer on the refrigerator door is nonadjustable and if for any reason it becomes inoperative the thermometer must be replaced. To remove the thermometer proceed as follows:

(1) Turn the indicator dial face ring (fig 71, item 3) with palm of hand to release the ring.

(2) Remove the 3 screws (fig 71, item 2) holding the thermometer to the door.

(3) Remove 6 screws from the thermometer guard located on the inside door panel (fig 2, item 2).

(4) Remove thermometer bulb from retaining clip.

(5) Straighten thermometer tubing to permit removal of thermometer through the front of door as shown in fig 71.

d. Installing the Dial Thermometer. To install the dial thermometer proceed as follows:

(1) Mount the thermometer on the outside of the door panel by passing the thermometer bulb through the opening in the door (fig 71).

(2) Secure the thermometer to door with 3 screws (fig 71, item 2).

(3) Install the indicator dial face ring by alining the pins of the ring with the notches on the thermometer and turning the

ring with palm of hand to a locked position (fig 71, item 3).

(4) Insert the thermometer bulb into the retaining clip.

(5) Secure the thermometer guard to the inner cabinet door with 6 screws.

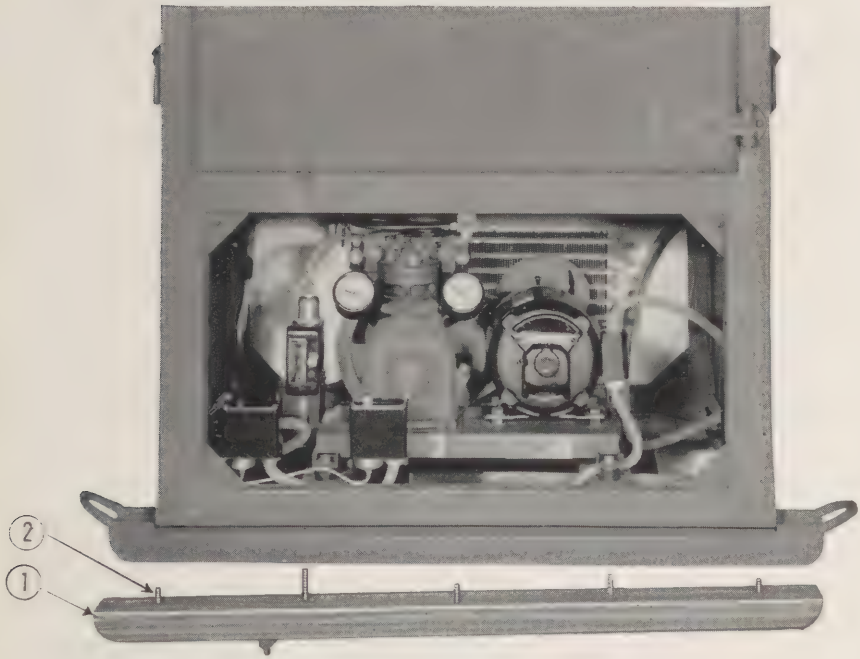


Figure 72. Replacing cabinet skid inserts.

	Med. Dept. No.	Nomenclature
1.	*9R27042*	*Insert, skid, wood*
2.	*SR01141*	*Bolt, 3/8-16 x 2 1/2 inch carriage*

e. *Repairing Damaged Panels.* Should the cabinet or door panels become punctured they must be repaired immediately to prevent moisture from getting into the insulation. To repair damaged panels proceed as follows:

(1) In the case of a small rupture the hole can be soldered by using a large soldering iron. Thoroughly clean the surface of the metal before applying flux and solder.

(2) In the case of a large rupture or tears in the metal, a sheet metal patch can be made to cover the damaged area. This patch can be held in place by either soldering or sheet metal screws. In the latter case a layer of mastic compound should be applied beneath the patch to make the joint air tight. After soldering on the outside surface the patch must be painted.

f. Replacing the Cabinet Skid Inserts. Should the skids be broken or indicate excessive wear they must be replaced. To replace the skids proceed as follows. (Fig 72.)

(1) Tip the cabinet forward or backward to gain access to the carriage bolts (item 2).

(2) Remove the 6 carriage bolt nuts from the unit compartment side of skids.

(3) Drive out the carriage bolts and pry the skid insert (item 1) free.

(4) Install new skid and drive carriage bolts into position.

(5) Replace the 6 nuts on each skid.

APPENDIX

Section I

Preparation for Storage or Shipment

60. PREPARING THE REFRIGERATION SYSTEM

a. If the condensing unit is to stand idle for any length of time the unit must be pumped down and the refrigerant isolated in the liquid receiver.

(1) Remove the machine compartment doors and pump down the system. (See par 41 a.)

(2) Inspect all valve stem caps to see that they are in place and secure.

(3) A tag must be attached to the extension cord plug with the following notation: "UNIT PUMPED DOWN—3 VALVES CLOSED."

61. PREPARING THE REFRIGERATOR STORAGE COMPARTMENT

a. Any accumulation of defrost water must be drained from the cabinet to prevent odors while the refrigerator is in storage. Drain the storage compartment by opening the drain shutoff valve in the unit compartment (fig 6, item 5).

b. Remove all racks, bottles and shelves. If the unit is to be shipped, the shelves, racks and bottles must be packed in corrugated paper to prevent damage to these parts while in transit.

c. Thoroughly clean the refrigerator compartment with cleaning solvent and permit the refrigerator door to stand open until the interior of the cabinet is thoroughly dry. Close the refrigerator door and secure by inserting the latch pin in the door latch.

d. Reinstall the machine compartment doors and secure with screws.

Section II

References

62. FIELD AND TECHNICAL MANUALS

a. Camouflage	FM 5-20
b. Defense against chemical attack	FM 21-40
c. Electrical fundamentals	TM 1-455
d. Decontamination	TM 3-220

e. Cleaning, preserving, lubricating, and welding materials and similar items issued by Ordnance Department — TM 9-850

f. Basic maintenance manual — TM 38-250

g. Moisture proofing and fungi proofing Signal Corps equipment — TB SIG 13

63. ABBREVIATIONS

a. Cubic Centimeters—cc

b. Revolutions Per Minute—R.P.M.

c. Society Automotive Engineers—SAE

d. Alternating Current—A.C.

e. Cycle—Cy.

f. Flat Head—fl. hd.

g. Shakeproof—shkp.

h. Round Head—R.H.

i. Hexagon—hex.

j. Machine Screw—mach. scr.

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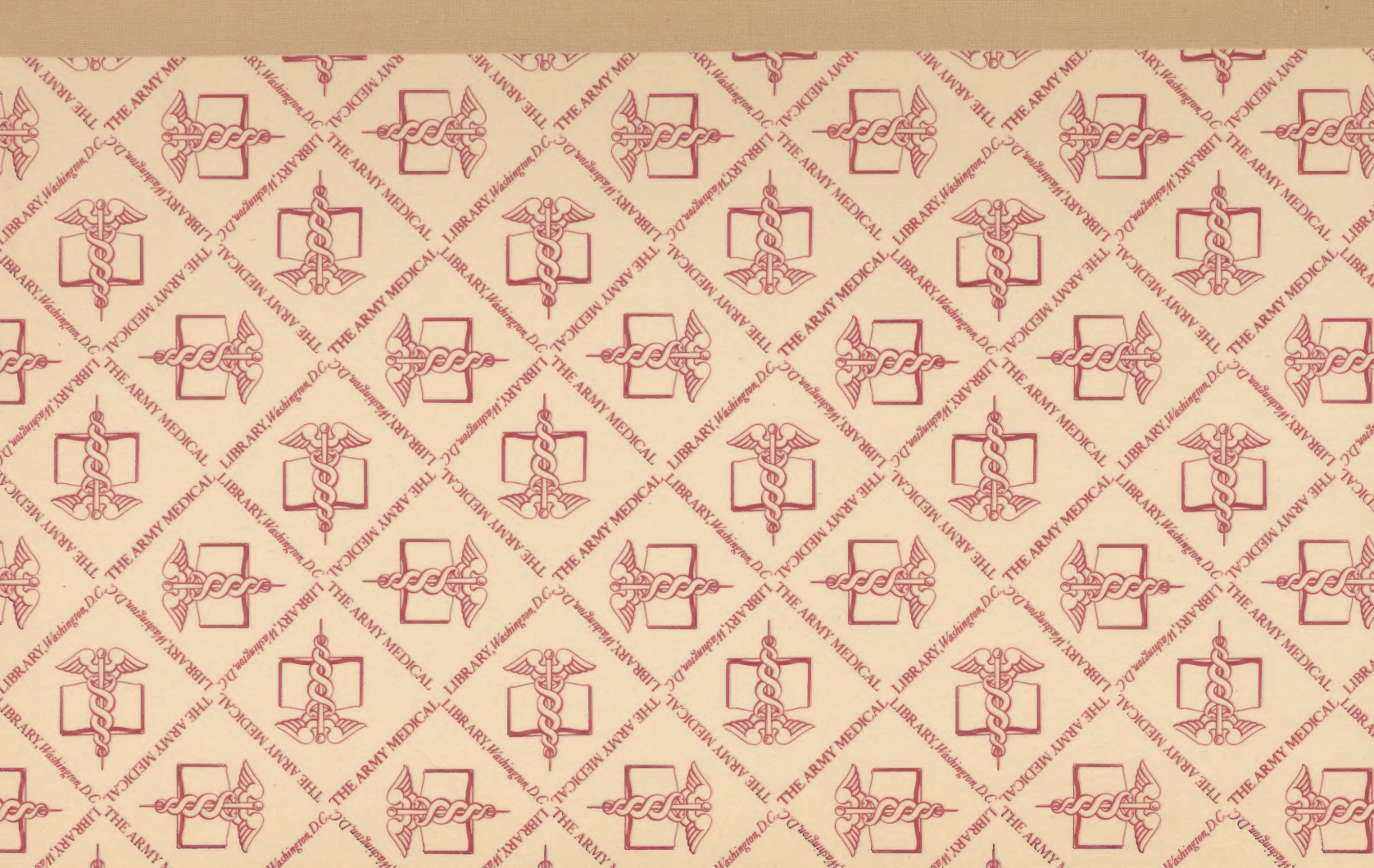
MAINTENANCE MANUAL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